**Responses to Comments** **April 2005**
**Androscoggin River TMDL**

## Fraser Paper

Letter of Jan 30, 2005
David L. Bishop, Fraser Papers Inc.

**Fraser Papers Comments on the Maine DEP TMDL for the Androscoggin**
In general the TMDL represents a significant step forward in quantifying the issues related to water quality on the Androscoggin River. Fraser does however feel there remains uncertainty that needs to be addressed over the upcoming summer sampling seasons to better determine the impacts of the operations, municipalities and non-point sources on the river below the Fraser mill to the ocean. Fraser's comments and concerns are described below.

**Allocation**
Initial allocations of pollutants for each of the point sources should be established in the TMDL, these allocations should be established in a phased manner over a period of ten years.

*Response: : EPA's regulations and guidance require individual waste load allocations(WLAs) as part of a TMDL. It is permissible to establish "default"WLAs, which may be changed after approval of the TMDL provided that the sum of the changed WLAs does not exceed the sum of the WLAs identified in the TMDL; that there is an opportunity for public comment on the changed WLAs; and that the changed allocations not create any local "hot spots. The default allocations and alternate allocations will be labeled in each table providing allocations in the final report. MDEP agrees that the WLAs can be implemented in a phased manner and that the implementation period may extend longer than a five year license period.*

These allocations should be based on the impact on the river and Gulf Island Pond of all the operations, municipalities and non-point sources on the non-compliant portions of the river. The TMDL must have provisions to revise the allocations throughout the phases of the TMDL implementation, based on better data and more accurate modeling as this information becomes available.

*Response: The TMDL will be reopened as new information is received and analyzed about the river and pond. Pollutant trading could be a good mechanism for revising allocations. The default allocation method is based upon impact to the river and pond. The Department may use a different allocation if there is agreement on a different approach.*

Allocation of orthophosphate loadings from each mill and the effect of the actual impoundment must be carefully based on impact at Gulf Island Pond in order to eliminate the algae bloom problems. The data with respect to phosphorous in the river and the uptake rates throughout the

watershed is very limited. Great care must be taken to avoid having sources spend considerable funds and effort to reduce the discharge of orthophosphates if that reduction cannot be shown to have a beneficial effect on the algae problem at the pond. There is an obvious need to gather more data to verify the findings of the model.

*Response: MDEP disagrees that the data being used to define ortho-P assimilation on the Androscoggin River are limited. The 2004 data is a good source of information to define phosphorus uptake on the Androscoggin River. The two data sets used for calibration and verification of phosphorus uptake satisfy the requirements needed to calibrate and verify a water quality model. However MDEP fully supports additional data collection by stakeholders in order to refine a variety of model parameters.*

**Time line**

. The implementation timeline should reflect that the TMDL would likely result in the lowest total P limits of any pulp and paper mills in the nation. In order to ensure that these limits are justified they should be established in a phased manner that allows sufficient time to investigate the impacts of the phased changes and adjust limits accordingly.

*Response: While the TMDL contains final WLAs, we agree that a schedule for meeting the phosphorus permit limits is appropriate and the WLAs and limits may be adjusted in the future if warranted by new information.*

There should be consistency in the watershed. The timeline to bring Gulf Island Pond to a water quality level appropriate for recreation in and on the water should not be different than the timeline for making the river below Lewiston-Auburn appropriate for recreation.

*Response: The timeline will be established during the implementation of the TMDL through waste discharge licensing. The CSO implementation period has been established on a case-by-case basis based upon the ability of each municipality to pay. For Lewiston-Auburn a period of 15 years was given to comply with water quality standards.*

*The Androscoggin River cleanup for Gulf Island Pond and the river up to Berlin has actually been ongoing for more than 20 years. DEP staff first issued a report in 1983 recommending large reductions in BOD for the two paper mills in Maine. The loads recommended then are actually quite similar to the current TMDL. The staff recommendation for reductions in BOD5 in 1983 was not implemented in the next round of licensing. A voluntary approach utilizing pollution prevention was used to achieve significant reductions in BOD and TSS at both mills. We have already known for more than 10 years that the current aeration system within the pond and the BOD and TSS reductions realized at both mills through pollutant prevention is not enough to meet DO criteria. The DEP recognizes that the mills have invested a large amount of money and effort in making these significant and voluntary reductions that is to their credit.*

. The TMDL should not specify the oxygen injection rates and locations of

oxygen diffusers since the WASP model does not model transport. This should be done using more current modeling, the type of three dimensional hydrological modeling carried by Wright Pierce in the assessments of the present diffuser should be a much more accurate tool in determining the requirements and best application of additional oxygenation.

*Response: The WASP model does model transport through advection and dispersion. It would not be possible to run any water quality model without transport. The way in which oxygen injection is specified in the TMDL could be re-structured to allow flexibility, given that there are many designs other than those mentioned in the TMDL report which could work. DEP supports using different models to analyze dispersion and injected O2 such as that specified in the GIPOP cooperative's report submitted to the DEP in November of 2004. The DEP model is needed to calculate oxygen injection requirements and the model introduced by Wright-Pierce to determine the most efficient and effective way to inject oxygen into the water column. The DEP model assumes a 1/3 transfer efficiency of oxygen to the water column. DEP recognizes the efficiency of this system can be significantly improved.*

. The time line for compliance with the BOD and solids should allow sufficient time for the operation to fully investigate non-end of pipeline solutions. Internal recycle and water system close up will result in better overall environmental performance. Internal recycle does not treat the problem but eliminates it, by reducing raw material waste, water and energy usage. This approach not only results in a much broader environmental improvement but also makes the operation more economically viable. This approach must be a well-planned phased approach to properly evaluate the effects on the mill process and products as each change is implemented.

*Response: Pollution Prevention approaches to waste reduction rather than end-of pipe technologies are encouraged. However, the Discharge Monitoring Reports (DMR's) for the last two years show that this mill is presently operating below the default allocations for BOD and TSS presented in the TMDL report. MDEP understands that Fraser increased production in 2004 and is in the process of implementing a number of process control and infrastructure changes in the mill and wastewater plants.*

**Model Conservative Assumptions**

The model's multiple layers of conservative assumptions result in a margin of safety that is undefined and likely overly conservative. This is a concern to Fraser with respect to the impact of our discharges to the Class B water quality standard at the Maine- New Hampshire border. As demonstrated in figure 11 in the TMDL, the effect of the mill discharge as modeled only results in a slight incursion into the minimum daily DO limit of 7 ppm. All testing at this point to date has not registered any values below the standard. Fraser feels that the conservative nature of the model in all likelihood significantly overstates the mill impact on DO at that point on

the river.

*<u>Response</u>: The statement that the model is overly conservative is not supported by fact. The class B minimum DO criteria are 7 ppm and even a slight excursion could result in non-compliance of DO criteria. There wasn't any testing of the Androscoggin River last summer in the area of the predicted non-compliance (state border). The three mill study did not propose to undertake any DO sampling here, but even if there were, the conditions last summer were not supportive of the worse case conditions used in water quality evaluations (low flow, high temperature, licensed discharge). There will be an opportunity for Fraser to collect this data in the future in order to better test the appropriate model parameters and their calibration with actual data at the state border.*

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In addition, Mr. Mitnik did not include the 2002 data, while the Fraser Mills were not operating, which shows greater non-compliance at Gulf Island Pond than when the mills were operating at full capacity. Fraser feels this data re-enforces the argument that all allocations be based on impact and that additional controls on an operation distant from Gulf Island pond does little to improve water quality in the pond.

*<u>Response</u>: There are many other factors which affect the levels of dissolved oxygen in Gulf Island Pond other than loading from paper mills. The summer of 2002 was a period of extended low flow conditions in which little run-off occurred for almost a two month period. Water temperatures were also warmer than average that summer. Given this information it is possible that the lower overall loading from the two paper mills in Maine still could result in a significant impact within Gulf Island Pond. Warmer water temperatures also result in conditions of low vertical mixing within Gulf Island Pond which contributes to lower dissolved oxygen levels in deeper water areas. The assimilation of BOD, TSS, and phosphorus are all carefully accounted for within the water quality model.*

The model relies on an implicit margin of safety resulting from several assumptions made in the modeling process. All point sources are assumed to discharge at their maximum allocated waste load simultaneously during a 10-year low flow event. The report acknowledges that "the probability of this occurring would be low" (page 3). These assumptions compound to create an implicit margin of safety that is undefined, is likely overly conservative, and that may largely preclude accurate model predictions.

*<u>Response</u>: MDEP has typically used implicit margins of safety in all river TMDL's currently approved by EPA. The Androscoggin River draft TMDL was consistent with what has been done previously. The model predictions with point sources at actual conditions in the 2002 Modeling Report compared well to measured dissolved oxygen in 1999 at conditions close to a 10-year low flow. Hence the model is not overly conservative.*

*Nevertheless, in response to the fact that many stakeholders have similarly criticized the undefined implicit MOS, the DEP has revised the final TMDL. . Instead of the undefined implicit*

*MOS, DEP added an explicit MOS of 10% , and also applied a cluster allocation that accounts for the statistical probability of all three mills discharging simultaneously*

Regarding the margin of safety, the draft Guidance for Water Quality Based Decisions: the TMDL process (USEPA 1999) states that among the factors that should be considered in evaluating and deriving an appropriate MOS is expressing the results of a TMDL analysis in terms of confidence intervals or ranges. These confidence intervals are not identified in the draft Androscoggin TMDL report. Without a credible effort to establish confidence limits, there are few constraints on the reasonableness of the MOS. An additional factor to be considered according to this draft guidance is the "implications of the MOS on the overall load reductions identified in terms of reduction feasibility and implementation time frames". This information is not provided in the draft TMDL and is warranted given the magnitude of the environmental decision and the potential implications of this TMDL.

*<u>Response</u>: A confidence interval is typically used in a very simplified model application such as the Qual2EU model of a short river segment. It would be difficult to derive confidence intervals on a model of the pond utilizing the WASP model, given the number of model parameters involved. DEP does not propose producing confidence intervals for the modeling results. DEP recognizes that a phased implementation allows for iterative analysis of all modeled parameters by moving toward attainment carefully while conscious of costs.*

**Other**

. The TMDL should specify that mills should be given the opportunity to either choose to adopt a weekly BOD limit or statistically equivalent monthly/daily limits. Note that the precedent in the State of New Hampshire for mills (and possible other industrial sources) is absent for weekly BOD limits.

*<u>Response</u>: Monthly average BOD5 limits are evaluated with the 30-day average DO criteria of 6.5 ppm. The weekly average BOD5 limits are evaluated with the daily minimum DO criteria. There must be independent limits to address both criteria. DEP will give the mills an option on accepting a water quality based BOD5 limit (that addresses meeting minimum DO criteria) as a daily maximum or weekly average. A maximum to weekly average ratio of BOD5 specific to each mill has been derived from discharge monitoring reports and has been used to derive an equivalent daily maximum limit in the final TMDL report. In this situation, weekly average limits will no longer be necessary. This has been added to the tables indicating the default and alternate allocations .*

. It is not appropriate to develop a chlorophyll-a threshold for algae bloom based upon a single event. There is little basis for establishing 10 ppb as the threshold for algae blooms in the TMDL. Page 5 of the report states, "[t]here does not appear to be a good relationship between algae

blooms and chlorophyll-a at any given location". However, the report goes on to suggest that using "pond averaged chlorophyll-a", "a good relationship is apparent in the chlorophyll-a data and observed blooms." This is based on the observation of a pond average chlorophyll-a value of 10 ppb occurring simultaneously with a bloom on August 4. This single observation of paired bloom-chlorophyll-a data is not sufficient to base a TMDL on. The report acknowledges the need for additional data to better link phosphorus and chlorophyll-a levels to algae blooms. It is therefore premature to use a value of 10 ppb to establish definitive phosphorus TMDL for this system.

*Response: This past summer DEP attempted to develop a chlorophyll-a threshold for algae blooms specific to Gulf Island Pond. While the data being used to define this are limited, there is ample information in the literature that is similar to the threshold chlorophyll-a being used to define algae blooms. For example, EPA's Nutrient Criteria Technical Guidance for Rivers (July 2000) uses a threshold level of 8 ppb for chlorophyll-a to define algae blooms. The DEP lakes assessment section has been using a chlorophyll-a threshold level of 8 ppb to define blooms in colored lakes (> 30 pcu) for more than 20 years. A pond averaged level of 10 ppb in Gulf Island Pond would appear to be a good place to start until more data can be collected.*

. The Livermore Falls and the Dead River issues were brought into the TMDL with no prior consultation and with no evaluation of the data used. Fraser feels this should be treated as a separate issue and not be included in the present discussion until the data is properly scrutinized and evaluated.

*Response: The Livermore Falls Impoundment is also a 303d listed water in the 2004 listing submitted to EPA, which must have a TMDL completed. This will also affect mill licensing decisions and is needed to issue licenses by June of this year. Since some stakeholders have commented on the issue of the Dead River as being a controlling factor in setting mill pollutants levels, this too needed to be addressed as part of the TMDL. The Dead River and the Livermore Falls Impoundment were mentioned at stakeholder meetings and a public meeting in December of 2004 attended by Fraser. Comments at both of these meetings by some stakeholders urged DEP to include the Livermore Falls impoundment as part of the TMDL and licenses issued in 2005. There has been opportunities for public involvement in the Livermore Falls impoundment through the Hydropower re-licensing process for International Paper. A stakeholder group was also established in this process. The data for the Livermore Falls impoundment can also be properly scrutinized in the TMDL review process. Rather than issuing separate TMDL reports, combining both TMDL's within one report is a more efficient use of staff time.*

## Maine Legislature

Senators: Bruce Bryant, Senator David Hastings
Representatives: John Patrick, Ray Pineau, Rodney Jennings, Randy Hotham, Arlan Jodrey, Bruce Hanley

Paragraph 1 – TMDL Report doesn't incorporate Rumford Public Meeting comments.

*Response: Many of the comments made at the meeting were actually used in the TMDL recommendations. For example, a phased approach with stepped pollutant reductions and additional data collection were recommended by many at the public meeting. This is, in fact, being recommended in the TMDL. People also commented that the mills needed more than five years to comply with the TMDL. Similarly people commented that the Dead River and Livermore Falls impoundment needed to be addressed in the TMDL which DEP did. Although the Dead River will be treated as a separate issue from the Androscoggin River TMDL's, a section has been added to the end of the TMDL report explaining the current water quality problems there with recommendations for data collection in the future. In addition, DEP is considering an implementation methodology which would allow more than five years to comply with the TMDL.*

Paragraph 2 – Economic Impact of TMDL.

*Response: There is no requirement to do an economic analysis on a TMDL. The TMDL is just an expression of the required pollutant loading needed to meet water quality standards. If the TMDL results in an economic hardship, a Use Attainability Analysis which considers economic impact directly could be undertaken by the mills. The TMDL will be implemented in stepped reductions in consideration of the significant potential costs of attainment.*

Paragraph 3- Sufficient Time to meet the TMDL.

*Response: This comment has been previously addressed. See Fraser Paper comments.*

Paragraph 4 – DEP needs to consider other sources of impact other than point sources.

*Response: It makes the most sense both economically and scientifically to reduce the pollutant loadings that are primarily responsible for water quality impacts to Gulf Island Pond. The paper mills are the loads that cause most of the impact to the pond. Non-point source loads during the summertime have negligible impacts to Gulf Island Pond. (Refer to NCASI and HydroQual comments for a more detailed explanation of non-point source pollution.) The erosion that was referred to at the public meetings could be having a significant impact on a smaller tributary stream. It is advisable to correct erosion problems within the watershed.*

Paragraph 5 – Livermore Falls Impoundment TMDL submittal is premature.

*Response: This comment has been previously addressed in Fraser Paper comments.*

## Livermore Falls WWTP

Kent Mitchell, Supervisor

On page 4 you state that there is uncertainty in modeling, I believe we have to be absolutely certain to impose the strict limits in this TMDL. These limits have the potential to possibly close the small mill in Livermore Falls, which is a third of our tax base. These limits will adversely

affect the jobs and economy of the entire Androscoggin Valley. We have to move forward slowly and wisely on this issue. From past data, all we will gain is reduction of a few days of low DO at the deep hole in Gulf Island Pond and a few minor algae blooms. What we could lose is much greater. I don't like the words maybe, probably, could, and likely in a report this important. UAA anyone???

*Response: We appreciate the need to increase certainty. This is why the model was updated and improved with actual ambient data collected in 2004 under reduced phosphorus loading. This has significantly increased the precision of the model. There will be additional opportunity to make further improvements on the model in the future. The TMDL is being implemented in stepped reductions as a balance to the uncertainty. DEP will not let license and TMDL requirements result in economic hardship. A UAA would be initiated before this could happen.*

In this report the phosphorus limits begin in May because of buildup in sediments, but in one of the older reports it was stated that there was no settling in May when the flow was high. We need to follow Paul's own method from page 7 (trial and error) to establish the accuracy of the model.

*Response: It is true that the calculations for sediment oxygen demand in the 2002 report assumed no settling. However the river travel time of up to two weeks could still occur in May. DEP originally included May phosphorus limits since phosphorus discharged in mid May could potentially affect the Pond's water quality in June. After consideration of the points made, DEP agrees that phosphorus limits in May are not necessary. Algae blooms in early June are not a serious threat. The TMDL has been revised to establish limits beginning in June.*

The report mentions in many places that the dam is only part of the problem, but it also says there would be non-attainment even if all point sources were removed due to the dam. However in Paul's Feb,13,2003 alternative analysis report alternative #4 **Alter or Eliminate Impound Waters** states that this would eliminate **all** non-attainment . This tells me that the dam is 100% of the problem and removal should be put back on the table as an option or possibly some combination of flow control and more oxygen injection by FPL. This might be more cost effective. Why isn't it being looked at?

*Response: At a stakeholder meeting in 2004, DEP Commissioner Gallagher eliminated dam removal as a feasible alternative that the Department would pursue. The TMDL report assesses impact from the dam, assuming it will remain in place. The 2003 report investigated the possibility of removing the dam. The assessments are not comparable*.

The real mind twister is the phosphorus assimilation rates above IP and below IP. From the data in table 6 it appears that the assimilation is 60 times higher between Mead and IP than it is between IP and Twin Bridges. I have canoed both these sections of river and there is no explanation for this much difference in P uptake. The lower section is shallow and has miles of places full of weed beds and plant life, which create a good environment for phosphorus uptake. Do to the rain events last year how can there only be .3 # of OPO4 from non-point at Twin Bridges? There is something very wrong with these numbers and this section of the river needs some further study before the assimilation amounts are accepted. (see attached sheet) Paul states

on page 7 that" the use of accurate uptake rates is **critical** for establishing license limits" so it is **critical** that we get this right from more than one year of questionable data!

*Response: Phosphorus assimilation rates assigned to the river have no impact on the phosphorus TMDL to Gulf Island Pond expressed as a load to the pond inlet. The P-assimilation rates will become critical when assigning allocations in the licensing process. There are thirteen weekly sampling events in which phosphorus was sampled. Each one of these has indicated that very little phosphorus is assimilated in the portion of the river from Livermore Falls to Twin Bridges. This is adequate data to support this conclusion. The low rate of assimilation can best be explained by the unfavorable conditions for growing algae in this part of the river. This portion of the river has input from all three paper mills and is the area where the highest levels of TSS and color occur. The growth of algae is limited by low light penetration into the water column. The river is also deeper here than the segments below Rumford which is also an unfavorable situation for growing bottom attached plants. There will be an opportunity to collect additional data here during the initial phases that the TMDL is being implemented. (Refer to the HydroQual comments for a more detailed technical explanation explaining the cause of low phosphorus assimilation on this part of the river.)*

The word indigenous appears which means the river will be kept to a higher standard for the protection of brook trout. Your own Fish and Wildlife Dept. has said that the river will be managed for warm water species, which do not mix well with trout. Most sensible people realize that the extra cost associated with brook trout criteria will be spent with absolutely no return for the investment. By the way the dam is not indigenous. UAA anyone???

*Response: Maine's Water Classification Program, including Water Quality Standards (WQS), is a goal oriented system. The Legislature sets the goals, within the parameters of the Federal Clean Water Act. To achieve the goals of the CWA and state statutes, to make all waters fishable/swimmable in the interim and to achieve zero discharge eventually, the Maine Legislature enacted WQS that require all rivers and streams, including Class C, be suitable to support indigenous species of fish. Support of a population includes critical life functions of survival, growth, and reproduction in order to make the population sustainable. Indigenous is defined in statute (38 MRSA sec 466) to mean any species existing currently or historically according to official records. Such records exist to document both the current and historical existence of trout and salmon in the Androscoggin River below Livermore Falls.*

In conclusion, I feel that the upper part of the Androscoggin is going to be held to a higher standard and with a shorter time table for attainment than the river below Lewiston. Our section of the river will be in compliance and Lewiston-Auburn will be allowed many years longer to keep overflowing raw sewage (331,000,000 gal last year). Livermore Falls spent $6 million and got rid of all of our CSOs . Now we have one of the highest sewer rates in the State (over $600/year). The only way this TMDL should be implemented is if a complete UAA shows that the money spent will give us a good return for the investment. Why isn't the compliance issue being applied to the entire Androscoggin River, and why isn't the NRC, DEP, and the downstream towns below LA outraged at the raw sewage flowing into the river?? (62 days last year). The current amount of development in LA is only going to make this situation worse in the near future. I remember when Farmington and Bethel had problems and the state told them "no

new hook-ups until the problem is fixed". I remember quite vividly that Livermore Falls built a 2 MGD treatment plant and only got licensed for a 1 MGD plant in the summer months. Is there a special policy for Lewiston-Auburn and the lower section of the river? If so, please explain!!

*Response: The issue of timeline was previously addressed in responses to Fraser Paper comments (p2).*

*Livermore Falls was never licensed as a 1 mgd plant in the summer. The current license allows up to 2 mgd year round. The mass loading for BOD and TSS were held constant in the summer temporarily until the TMDL could be completed (based upon the old BPT mass limits at 1 mgd). This was done because the Clean Water Act does not allow licensed increases of pollutant parameters for 303d listed segments until a TMDL is completed and approved. The recommendation in the draft TMDL are for BPT for all municipal point sources for BOD and TSS meaning that Livermore Falls should get the increases in BOD and TSS that were formerly requested.*

## Town of Gorham

Letter of February 1, 2005 to George Berlandi, P.E. of NHDES. Electronic version of letter not available.

Issues:

- Based upon the limit contribution of phosphorus, BOD, and TSS from Gorham entering the Androscoggin River, Gorham questions whether the cost burden and growth limitations that would result from the TMDL are justified.
- The small amount of ortho-P from Gorham that the model predicts is entering the pond raises doubt as to whether or not any ortho-P from Gorham actually enters Gulf Island Pond.
- Gorham effluent data limited. More effluent data is needed.

*Response to letter: The default allocations provided in the TMDL report are not final license limits. The municipal inputs that are distant from Gulf Island Pond and have a very low impact on the pond will not have an immediate phosphorus limit on their license for the next five year period. This would include Berlin, Gorham, and Bethel and Rumford-Mexico. There will be a requirement to monitor phosphorus in the summer. There must be a system established in the DMR submittal to compare the current level of discharge to the assigned allocations. As the mass loadings for phosphorus approach the assigned allocations, it may eventually be necessary to include a mass phosphorus limit within the license.*

*The towns should realize that as they continue to grow, a phosphorus limit may be forthcoming. The mass loading of BOD and TSS cannot be increased either, so as the towns grow, treatment must be improved. In a TMDL segment, the trend in loading must be downward so that water quality standards can eventually be met. There will be ample time in the phased TMDL to collect any additional data that the towns feel are necessary.*

## Town of Jay

Letter of February 14, 2005
Ruth Marden, Town Manager

Issues:

- Only 1 mgd allocated to Livermore Falls in recent waste discharge permit. The plant is designed for 2 mgd. Limits future growth in Jay and Livermore Falls. Concern stated for depressed economy in Jay and Livermore Falls.
- Dam is cause of problem, not discharges.
- Algae bloom threshold inappropriate.

*Response to letter: The waste discharge license issued for Livermore Falls included a flow of 2 mgd, not 1 mgd. The mass loading for BOD and TSS was held at levels based upon 1 mgd until the TMDL could be completed. The Clean Water Act does not allow for increases in pollutants when a TMDL is pending. The draft TMDL restores mass BOD and TSS limits at technology limits based upon 2 mgd. The waste discharge license for Livermore Falls will be modified to incorporate these changes.*

*DEP Commissioner Gallagher stated at a recent stakeholder meeting the removal of Gulf Island dam is not an option which DEP will pursue. DEP is optimistic that a solution can be found that will result in full attainment of water quality standards with the dam in place without adversely affecting the economy of Androscoggin River communities.*

*The chlorophyll-a threshold for algae blooms was previously addressed in responses to Fraser Paper comments (p2).*

## Maine Rivers

Maine Rivers appreciates the opportunity to comment on the draft TMDL for Gulf Island Pond. The document is clearly the result of a massive amount of work, and we are thankful for the dedication that obviously went into its preparation.

As you know, Maine Rivers has been concerned with the health of the Androscoggin River for some time now. We are concerned not only because we believe that the river has been treated poorly across the board – with virtually every substantive improvement in the river's water quality the result of difficult and protracted political battles -- but also because our treatment of the Androscoggin has repercussions for rivers across the state.

Thus, we were dismayed to see that the 22 degree standard for dissolved oxygen was inappropriately used to generate the BOD portion of the TMDL. DEP well knows that while the legislature may have intended to pass this standard, this is not in fact the standard that is in statute, and by law should not be used.

Similarly, we are very concerned about DEP's lack of leadership in setting discharge limits for the upstream mills. DEP clearly has the authority to do this. By handing off the problem to the

mills themselves to work out, DEP contributes further to the already deplorable delays in issuing meaningful licenses that would result in water quality improvements in the impoundment.

In addition, we would urge DEP to place the findings of this past summer's study of the impoundment in perspective. The season was cold and wet, and any conclusions drawn from it should be interpreted in that light. We are also puzzled by the assertion that extremely large amounts of phosphorus discharged by the mills can be taken up in the river before they reach Gulf Island Pond. How is this possible? Where does this phosphorus go?

Finally, we understand the need for oxygen injection to augment DO levels in the impoundment. But we would hope that over time, DEP will move towards a regulatory regime in which the river is healthy enough to sustain adequate amounts of dissolved oxygen in it, without the necessity of artificial injection. The bubblers are a technological fix for a river that, very simply, needs to be cleaned up.

*Response: There is presently no finally approved numerical monthly average dissolved oxygen standard for Class C waters. However, as has been done in the past, the DEP has used a numerical monthly average standard in order to further interpret the narrative standard which states that discharges to Class C waters "may cause some changes to aquatic life provided that the receiving waters shall be of sufficient quality to support all species of fish indigenous to the receiving waters . . ." [38 MRSA §465 (4)(C)]. The DEP has used a monthly average dissolved oxygen standard of 6.5 ppm to be applied whenever the daily water temperature is equal to or less than 22 degrees in this TMDL.*

*The use of a monthly average standard that considers temperature is premised on the fact that a monthly average standard is designed to protect for those conditions over which salmonid growth may occur. A daily average standard is designed to protect for survival conditions. The Department evaluated a range of studies (Forseth, 2001; Brett 1979, et al.), and the EPA's 1986 Ambient Aquatic Life Water Quality Criteria for Dissolved Oxygen (Freshwater) (the "Gold Book") to determine that salmonids can reasonably be expected to grow over a range of temperatures, where 24 degrees celsius is reasonably considered an upper limit where rate of growth ceases. The DEP also convened a workshop of fishery experts to discuss setting an appropriate temperature to apply as a 30-day average. As expected, there was disagreement among these experts about a specific temperature. The DEP considered the information provided by the experts in determining an appropriate temperature. An incipient lethal temperature is somewhere above 24 degrees, perhaps beginning at 26 degrees.*

*While 24 degrees is reasonably considered the upper limit of growth, 22 degrees as an upper limit captures the majority of the time during which salmonids would be growing. If growth rate is plotted versus temperature the curve would show a gradually increasing rate of growth beginning at 8 to 10 degrees celsius and leveling out somewhere around 20 degrees. After 20 degrees celsius the rate of growth steeply declines approaching zero at around 24 degrees. 22 degrees is reasonably considered to be on the descending portion of the growth curves where rates are dropping and approaching zero. Evaluated another way it can be said that a temperature standard of 22 degrees captures 85% of the temperature window over which growth occurs.*

*Further, 22 degrees captures the bulk of total amassed growth because of how the rate changes over time. Gary Chapman, one of the authors of the EPA "Gold Book", provided information (he did not take a position on any particular standard) to the Department last year during legislative deliberations on this standard. He presented modeling results which showed how the application of these two different temperatures would affect the total weight of an individual salmon. The modeling results showed that a salmon subject to a 22 degree standard would gain 2 grams less of weight than one subject to a 24 degree standard. Neither fish would lose weight, they would only grow slightly less over the course of a year. In the case of Chapman's modeling results, which are not empirical observations, a "22-degree" fish has 98% of the weight of a "24-degree" fish.*

*The DEP therefore finds that the use of a 22 degree standard is reasonable and is in keeping with the narrative standard that requires that Class C waters shall "support all indigenous species of fish."*

*Brett, J. R. 1979. "Environmental factors and growth" in Hoar, Randall and J.R. Brett (eds). Fish Physiology, Volume 8. New York: Academic Press*

*Forseth, T., et al. 2001. "Functional models for growth and food consumption of Atlantic salmon parr, Salmo salar, from a Norwegian River" Freshwater Biology **46**, 173-186*

*DEP is not reluctant to set license limits and still plans to have all licenses issued by June of this year. The final TMDL contains default waste load allocations based upon impact, but it is permissible for the WLAs to change subsequent to TMDL approval provided that such adjusted WLAs are subject to public notice and comment in the MEPDES permit issuance process and ensure that the total WLA for each TMDL will be satisfied and that there will be no localized impacts.*

*While it is true that last summer was not ideal conditions for sampling, the DEP has been collecting data on Gulf Island Pond for several years now. Last summer's data is only one source of information used to develop the TMDL. The data collected to date is adequate to develop a TMDL. Additional data will be collected in the future.*

*Phosphorus assimilation rates assigned to the river has no impact on the phosphorus TMDL to Gulf Island Pond expressed as a load to the pond inlet. The P-assimilation rates will become critical when assigning allocations in the licensing process.*

*Phosphorus is assimilated in the river mainly by uptake by bottom attached algae and plants which utilize the phosphorus for their growth. Hence the phosphorus is converted to plant biomass. Since the plants are stationary and are attached to the river bottom, this phosphorus is not transported downstream to Gulf Island Pond. Particulate phosphorus can also be assimilated through settling to the river bottom before it reaches Gulf Island Pond. A very simple calculation utilizing a mass balance can be made to determine the incremental increase in phosphorus from each point source discharge. This assumes no assimilation. The water*

*quality model performs this calculation. This can then be compared to the actual downstream data. The data collected downstream was considerably lower than a calculation assuming no assimilation would indicate. Hence it can be deduced that much of the phosphorus lost is through assimilation. MDEP has observed these phenomena on virtually all other river studies that have been undertaken recently.*

*The oxygen injection system will be necessary for many years to come. The model predictions indicate that even without point source discharges, some non-attainment of DO criteria will occur. The DEP assumes all parties involved share your aversion to the oxygen diffuser. But there is really no other viable solution that will get us to full attainment on Gulf Island Pond.*

## Androscoggin River Alliance

Letter of February 15, 2005
Dr. Gregory D'Augustine, Chairman

In general, as I communicated earlier via email to Paul Mitnik, we are concerned about the DEP's reluctance to set license limits when it currently has the authority to do so. Given that these licenses are already years late, allowing the mills to bicker and bargain among themselves to allocate those limits seems an abrogation of the state's responsibility, and yet another way to drag out this process. We would urge DEP to exercise its authority, use the information that it has generated through this TMDL, and set license limits.

Secondly, the focus of much of the ARA's work over the last nine months has been the issue of dissolved oxygen in Gulf Island Pond. Thus, we were confused, frankly, when we saw that the 6.5 ppm 30 average criterion at 22 degrees was used in the DEP's calculations for the draft TMDL. As we understand it, the legislature did not pass this particular standard last year, so how is it legal for the DEP to use it? Indeed, given the assertions by your own agency scientist, Barry Mower, regarding the use of the 22 degree standard, we cannot understand how DEP could assert that discharges at this standard could be protective of indigenous species, which the law requires. This is from an email sent by Mower to you on May 11, 2004:

"Selection of the 22 C limit essentially prevents application of the 6.5 ppm monthly average for most of the summer at Gulf Island Pond, the only time it is not met now and when it is most needed. That means the only criterion we can use is the survival criterion of 5 ppm. In a meeting to solicit the advice of fishery biologists from the other agencies, as you asked me to do, they all agreed that 5 ppm was not enough to support a cold water fish population. Therefore, we don't agree that the new statute will allow attainment of the narrative criteria, i.e. support of indigenous species of fish. The 22C temperature limit has no basis in biology or EPA ambient water quality criteria."

Finally, we are concerned that the phosphorus limits proposed in the draft TMDL are not adequate to protect Gulf Island Pond from algae blooms. We do not

understand how it is possible for the large amount of phosphorus discharged by upstream mills to virtually disappear by the time it would arrive in Gulf Island Pond.

*Response:* *These issues have previously been addressed in responses Maine Rivers.*

## Rumford Mexico Sewage District

Letter of February 15, 2005
Gregory Trundy

The report proposes that phosphorus limits for point sources on the Androscoggin be in force from May through September. Starting this in May is a new concept for me. The District has not monitored phosphorus discharges in May so I have no direct data on the quantity of this discharge. I know that during the summer months our discharge was relatively stable except during high flows related to storm events. Since May tends to be wetter than the summer months I have real concerns that the District may not be able to meet the limits in the draft report during May. By proposing these limits be in force in May this could require the municipalities to treat to remove phosphorus, something that probably wouldn't be necessary using a limit of 1.5 times actual discharge during the summer months.

This could be resolved by having a limit in force only from June through September or by using a limit based on 1.5 times the actual discharge including data from May. Another alternative might be to have a seasonal limit rather than a monthly limit. By doing this, wet weather flows would have less impact and we're really concerned with the overall effect for the entire summer rather than one month.

*Response:* *The river travel time of up to two weeks could still occur in May. Hence phosphorus discharged in mid May could potentially affect the Pond's water quality in June. DEP agrees that algae bloom problems in May and early June are very unlikely. DEP will reduce the May phosphorus requirement to "monitor only".*

One interesting point that comes out in the TMDL report is what a small impact the municipal dischargers have on the phosphorus levels in Gulf Island Pond. The table below, using discharge data and assimilation factors from the report shows that the municipalities each contribute less that a part per billion of ortho-phosphate phosphorus to the level in the pond. Together the municipalities above the Livermore Falls impoundment contribute less that 0.4 ppb and all the municipalities together contribute less than 1.3 ppb to the level in Gulf Island Pond.

Ortho-Phosphate Discharge

| Town | OPO4-P ppd | Assm Fctr | ppd at GIP | ppb at GIP |
|---|---|---|---|---|
| Berlin | 11.4 | 1.60% | 0.18 | 0.020 |
| Gorham | 7.9 | 3.90% | 0.31 | 0.034 |
| Bethel | 4.5 | 10.80% | 0.49 | 0.053 |
| Rum-Mex | 18 | 14.90% | 2.68 | 0.292 |
| Liv Falls | 8.1 | 98.40% | 7.97 | 0.869 |

I think you could make an argument that regulating the municipal dischargers, even to the point of eliminating any discharge of ortho-phosphate, does not do much to improve the water quality in Gulf Island Pond. In fact it would be difficult to measure the change in ambient phosphorus due to such a discharge reduction. I would suggest that at this time regulating municipal phosphorus discharge is not necessary or helpful in improving the Androscoggin River. Moreover, if municipal discharges are not regulated then they could be modeled at their actual discharge levels rather than at the proposed 1.5 times actual levels which might help in reaching a proposal that everyone can live with.

*Response: The pie chart diagrams of estimated phosphorus loads to Gulf Island Pond (Figure 10) in the TMDL report indicate that the municipal point sources above Jay (Rumford-Mexico, Bethel, Gorham, Berlin) account for about 2.4% of the total-P and 6.3% of the ortho-P. As the mill phosphorus sources are reduced, and the towns grow, the percentage of the ortho-P attributable to these discharges will increase. Some type of limit may eventually be needed for ortho-P. DEP will consider making the requirements for these towns as monitor only for the initial phase of the TMDL and using an allocation that is equal to the seasonal average rather than 1.5 times the seasonal average. At the end of the initial phase of the TMDL, the appropriateness of phosphorus limits for these discharges should be re-evaluated.*

## Rumford Pulp and Paperworkers Resource Center.

Letter Of February 3, 2005
Director, Dean Gilbert

## Fran Dragoon

Letter of February 3, 2005

Issues in both letters.

- Implementation and time frames flexibility
- Economy of communities
- Include dam owner in TMDL
- Fair Treatment within watershed

*Response: The Department is very sensitive to economic conditions at the paper mills, but believes water quality on the Androscoggin River can be significantly improved without adversely affecting economic viability at the paper mills. The paper mills will be given a compliance schedule that is flexible. The TMDL will be implemented in stepped reductions with ongoing ambient monitoring. The default position for allocation will be based upon impact unless dischargers can agree upon something different. This will result in good treatment performance not being penalized. The TMDL states that the operation of the dam contributes to non-attainment of DO and algae blooms. The implementation will include FPL Energy through 401 certification.*

## Town of Jay

Sewer Department
Letter of February 16, 2005. Not available in electronic format.
Mark L Holt

1. Issue: A river classification is not appropriate for Gulf Island Pond.

*Response:*
*1. While DEP does understand that much of the debate in past years has been how impoundments are to be treated in state water quality standards, the assignment of a pond (lake) classification would not result in a better situation for point source discharges. The criteria for lakes require a "stable and decreasing trophic state" and "shall be free of cultural induced algae blooms." The evaluation process for lakes result in TMDL's that are much more restrictive than rivers. If Gulf Island Pond were re-classified to lake status, all point source discharges would have to be entirely removed from the Androscoggin River. Assignment of a new "impoundment" classification has been considered, however this would require a UAA if lower standards were proposed.*

*The oxygen requirements for salmonids are not any different in either water body. Low dissolved oxygen levels are not good in a pond or lake. In fact, low deep water dissolved oxygen in a lake is usually a warning sign that a lake's water quality is declining and blooms may soon be evident.*

2. Issue: Chlorophyll-a threshold to define algae blooms uncertain.

*Response: This has previously been addressed in responses to Fraser Paper comments. More data will be collected in the future based upon monitoring requirements of the TMDL. The chlorophyll-a threshold level will be revisited each summer based upon the additional information gathered.*

3. Issue: Trout do not appear in ponds, only free-flowing river segments.

*Response: Trout and other salmonid species occur in hundreds of lakes, ponds, and riverine impoundments statewide and are indigenous to those waters. The major limitation there now is the lack of suitable dissolved oxygen levels in its deeper waters.*

4. Issue: MOS conservative. Municipal WWTP's are not at licensed levels during low flow.

*Response: EPA requires that licensed loads be used when evaluating water quality. If actual loads dictated by good treatment performance are much lower than licensed loads, a point source can have their allowable licensed loads reduced. If a point source discharge is not willing to have their licensed loads reduced, the full load will be used when evaluating water quality impacts.*

5.Issue: A contradiction exists in the 2003 Alternative Analysis Report which states the dam is responsible for 100% of the impact and the 2004 TMDL report which states that the dam is responsible for 30% of the impact.

*Response: The Alternative Analysis Report (February 2003) did state that assuming Gulf Island dam is removed, water quality standards could be met. The TMDL report states that assuming that the dam remains in-place, 20% of the algae bloom affect can be attributable to the dam. These are not contradictory statements as they are considering alternative scenarios.*

6. Issue: Non-point sources were not properly quantified. The town objects to the use of the 2004 data for determining the TMDL.

*Response: Non-point sources of pollution are addressed in the responses to HydroQual and International Paper's and FPLE's comments. Conditions for sampling are rarely ideal and the DEP must make the most of the available information. The 2004 data are only a small component of the available data used to derive the TMDL. DEP has been collecting data on the Androscoggin River for more than 20 years now. Even though the 2004 data are less than ideal, it still provides valuable supplemental information for such components as the phosphorus assimilation rates in the river.*

*Very large runoff events such as the one you mention (5.7 inches of rain) could not contribute to an algae bloom on Gulf Island Pond. In a lake with a retention time of several months, this, indeed, could be important. On the Androscoggin, Gulf Island Pond would be flushed of any residual algae quickly and the flow through time would be as brief as two or three days. There is simply not enough residence time to grow significant levels of algae. During high flows very little settling would also occur and hence the contribution to bottom sediments is not an issue.*

*The phosphorus level coming from the Dead River and other tributaries are factored into the model. So this was considered.*

7. Issue: Phosphorus assimilation rates inaccurate.

*Response: This has previously been addressed in responses to Livermore Falls comments.*

## National Council of Air and Stream Improvement

James E. Palumbo, Research Engineer

**1. The calibration and validation phase of the model building process is compromised by the use of the vertical dispersion rate as an adjustable parameter.**

The 2002 Androscoggin River Modeling Report (pages 21-22) details the calibration of the model to dissolved oxygen data. The report states that the main calibration parameters were BOD decay rate, reaeration rate, and vertical dispersion rate. The vertical dispersion rate was used to account for modeled vs. measured dissolved oxygen discrepancies which were attributed to variable mixing conditions during the calibration period. This method is a potentially large

source of uncertainty to the model because the variable vertical dispersion rates can be used to compensate for errors in other parameters such as BOD decay, reaeration, and SOD. In this way the vertical dispersion rate is an additional free parameter in the dissolved oxygen balance.

The proper calibration of a robust water quality model is achieved through defining many system specific input parameters through measurement and reducing the number of free parameters available to the modeler. The greater the number of free parameters in the model and the greater the possible range of these parameters the higher the model uncertainty. In this model there are three identified calibration parameters.

In most water quality calibration procedures the hydrodynamic characteristics of the model are calibrated separately from the water quality characteristics to eliminate the potential use of hydrodynamic parameters to calibrate water quality values. In nearly all of the recent (2001 – present) water quality models that NCASI has reviewed for vertically stratified systems, a separate hydrodynamic model has been used to independently calculate vertical dispersion. Many of the most widely used models for impounded systems such the Army Corps of Engineers model CE-QUAL-W2 have internal hydrodynamic mechanisms to calculate vertical transport. The US Environmental Protection Agency's WASP model allows the import of hydrodynamic model output from models such as the Environmental Fluid Dynamics Code (EFDC) and others. These observations on the current state of the science of the modeling of vertically stratified systems imply that water quality modeling experts in government, industry, and academia have acknowledged that the use of hydrodynamic transport parameters for calibrating a water quality model is a significant source of uncertainty in the calibration which can be alleviated with modern methods.

An additional concern about the calibrated vertical transport parameters and the characterization of total transport in the pond relates to the use of the model as a tool for the design and operation of the oxygen injection system. The large degree of uncertainty in the characterization of transport in the pond is a significant limitation when evaluating the mitigating effects of oxygen injection, especially in the lower reaches of the pond. The model's current characterization of transport is not adequate for this type of use.

*<u>Response</u>: The use of a different model such as CE-QUAL-W2 has been previously addressed in Responses to Comments to the 2002 modeling report. The DEP ruled out this option due to limitations in available resources (staff time and monetary considerations) and the unlikely benefits that could be gained given the large amount of resources invested. The paper mills were aware that DEP was not going to pursue utilizing a hydrodynamic model for more than three years, yet took no steps to pursue this option on their own.*

*While the use of such a model may adequately model the hydrodynamics of a three dimensional system, the data requirements and time involved in calibrating a more complex model are considerably more comprehensive than the use of a model such as WASP. The only true way of calibrating the transport of a hydrodynamic model is to undertake a dye study. This level of effort is not typically undertaken in river projects utilizing a hydrodynamic model. The typical approach is the assumption that transport follows equal temperature. This is not truly a separate calibration of transport.*

*DEP's alternate method of modeling transport is through the assignment of flow based upon volumetric considerations and vertical dispersion based upon dissolved oxygen gradients. There are many dissolved oxygen data sets of the pond already available to use as comparisons to the model to determine whether or not it is performing reasonably. The other parameters that are mentioned (BOD decay, SOD) affect dissolved oxygen as a whole within the pond. BOD is actually not a free parameter since the calibration of ultimate BOD is the main basis for defining the decay rate rater than the DO profile. It is the transport mechanisms that widely affect the DO gradient and hence DEP's method is reasonable. The indications are that the WASP model is performing well enough to establish requirements for initial stages of the TMDL and preliminary end points subject to change by additional data collection and/or evaluation.*

*The WASP model is an EPA approved model that has already been used in other applications involving approved TMDL's in Maine. It is more than adequate to set a TMDL for the Androscoggin River and Gulf Island Pond. In either model there are many free parameters which can compensate for one another to some degree. This does not necessarily mean that the model prediction is inaccurate. The paper mills or NCASI can develop such a model if they so desire. DEP recommends that the bulk of future efforts on data collection as the different phases of the TMDL are implemented rather than additional model development.*

**2. The methods used to predict sediment oxygen demand (SOD) under various point source loading scenarios are overly simplistic and not appropriate for this model.**

Sediment oxygen demand (SOD) is the most significant oxygen sink in the Gulf Island Pond model as indicated by sensitivity analysis. Many if not all of the far reaching environmental decisions that may depend on this model's predictive output are based primarily in the linkage between the point sources and the dissolved oxygen deficit caused by SOD. However, the calculation method the model uses to arrive at SOD values for calibration and also for predicting SOD at different point source loadings is an approximation that is not appropriate for use in this predictive model.

While SOD is incorporated in the WASP5 model as an oxygen sink, it is calculated as a function of organic carbon flux (both algal and TSS) to the sediment bed outside of the WASP5 framework. Unlike the WASP5 model, the SOD calculation method is not peer reviewed nor is its use cited for any previous SOD modeling effort. In addition, no data have been collected to verify the method's predictive ability under various point source loading conditions. Data collection efforts that develop a solids balance around the pond would provide valuable information for testing the current SOD analysis.

One apparent problem with the method is that it assumes a linear relationship between organic carbon flux to the sediment and resulting SOD. Research into the modeling of SOD has shown a more complex, non-linear relationship. The mechanisms that result in this non-linear relationship (summarized in DiToro et al. 1990) are being incorporated into several popular water quality models including QUAL2K, WASP6, WASP7, and CE-QUAL-W2. The non-

linear relationship specified in these models may have significant implications for the predicted SOD rate under forecasted loading conditions.

*Response: The SOD calculations are inexact, but so are the methods that you are suggesting. Some adjustment is appropriate for varying point source loads. It would be difficult to calibrate the SOD rates to varying point source loading. This would involve additional study over several years. Variable loading conditions do not always exist. For example, how would one calibrate a SOD load at zero discharge conditions? A desk top analysis such as that implemented in the Androscoggin River TMDL has the large advantage of generating SOD estimates with existing information in a much smaller time frame. NCASI and the mills can obtain this information in the upcoming summers in the initial phase of the TMDL. The DEP does not see a large advantage to doing a long involved study that would still have an end product that is also inexact, but would rather recommend future resources on data collection as the different phases of the TMDL are implemented. The method used by DEP does not assume a linear relationship between carbon load reduction and SOD reduction. The amount of carbon that settles is used in the SOD calculation. This is not linear in WASP.*

**3. The non-algal diurnal dissolved oxygen adjustment in the deeper parts of the pond is not linked to any natural process simulated by the model and is not predicted by the model. This represents a significant uncertainty in the water quality model.**

Page 52 of the Androscoggin River Modeling Report describes data from a continuous monitor showing diurnal fluctuation of dissolved oxygen in which minima and maxima do not always occur in the early morning and mid-afternoon, respectively, as would be expected from algal respiration and photosynthesis. In addition, this fluctuation also occurs in the lower depths of the pond where algal activity is not expected. The fact that the magnitude of this fluctuation is continuous and consistently around 0.8 mg/L indicates that it may be the result of some periodic hydraulic process not captured by the model. In any case, this phenomenon should be more rigorously characterized and linked to some understood process before its result (a 0.4 mg/L oxygen deficit) is attributed to the point sources. This point is also relates to a following comment on multiple layers of conservatism.

*Response: There is some natural variability within chemical water systems that occurs on a hourly basis which must be accounted for. The model output of DO is a long term average over several days. There is a daily variability associated with this from other chemical parameters and rates which also vary. The diurnal adjustment to deeper layers of the model is based upon actual continuous data. No modeling is needed to generate these numbers. Actual data are always a better source of information than modeling. This is not a conservative assumption. The class C minimum DO criteria are a daily minimum. Without this adjustment, the model result would not be protective of minimum DO criteria.*

**4. The assignment of different BOD decay rate constants to the pond for different point source loads is not appropriate.**

Increasing the BOD decay rate constant as a function of an increase in the modeled BOD discharges from the mills is inappropriate in this case. Common practice in water quality

modeling is not to adjust such parameters without a firm scientific basis for doing so. The adjustment assumes that the materials discharged at the higher rate are of a different and more degradable quality than those discharged at the lower rates. This assumption is based on the hypothesis that the calibrated BOD decay rate in 1984 (0.05 per day) and 2000 (0.03 per day, which was also lab verified) is different because of the much lower BOD level experienced in 2000 (Androscoggin River Modeling Report 2002). This assumption is then used to increase the BOD decay rates for TMDL and licensed-load prediction runs by 33% and 66% respectively. This logic is faulty because today's effluents are not comparable to those in the 1980s. There have been changes in the processes that generate the effluents (e.g. conversion to ECF bleaching, implementation of spill controls and other BMPs, changes in process additives), as well as the treatment processes used at the mills. In any event, the justification for the magnitude of the decay adjustment (33% and 66%) is not tied to any quantitative, site-specific analysis and is therefore speculative. Because there is no scientific basis for assuming this situation, the adjustment should not be made in the model.

*Response: The BOD decay rate is a rate applied to the pond, not effluent. Your statement involving the changing of mill processes over the past 20 years are specific to effluent decay rates not river decay rates. There is no value to effluent decay rates in river modeling.*

*Alternatively, when two data sets result in different inputs for calibration, the average of the two can be used in the model prediction run. The pond BOD decay rate assigned to the TMDL run is 0.04 per day which represents an average of the calibration/verification. There is sound basis for assignment of the pond BOD decay rates in the TMDL.*

*HydroQual noted in its comments to the 2002 modeling report that a decay rate of 0.03 "is on the low end of typical literature values." Given that the BOD decay rate can be slightly variable, the modeler must be careful what rate is assigned in the prediction runs which are under much higher loading conditions than the calibration data set. Adjustment to the average decay rate measured in the calibration / verification is justifiable in this situation.*

*The appropriateness of using different BOD decay rates under different loading should be obvious if one considers the following. Would river decay rates be the same under licensed loadings and zero discharge of point sources? They would be quite different in DEP's opinion.*

**5. The assignment of different BOD decay rate constants to the pond for different point source loads is not consistent with the BOD decay rates assigned to the river.**

The argument is made that under simulated higher point source effluent flow conditions (i.e. licensed loads) the BOD discharged will have a higher decay rate constant. While we disagree with this argument (see Comment #4), we note that the BOD decay rate constant entered into QUAL2E for simulated high point source effluent flows are held constant under all effluent flow conditions. This is contradictory to the argument being made by the State of Maine that higher effluent flows result in higher decay rate constants. A higher decay rate constant in the QUAL2E model will have the effect of lessening BOD boundary loads to the WASP5 Gulf Island Pond model. As detailed in Comment #4, we do not think there is sufficient scientific evidence to support discharge-variable BOD decay rates.

*Response: Unlike the pond, there is no specific information on how the BOD decay rates should be adjusted in the river, so the traditional approach used by modelers in keeping the decay rate constant is used in the riverine portion. The assignment of river decay rates does not affect the BOD TMDL expressed as a load to the pond inlet. The river decay rate is only an issue with the allocation of BOD to specific point sources.*

**6. It is inappropriate to assume that Gulf Island Pond is not well mixed chemically but is well mixed thermally.**

Typically, thermal gradients act as a significant driving force in the vertical mixing of deep waters. At temperatures above 4°C, warmer water is less dense and thus floats on top of colder water. This phenomenon causes a low amount of chemical mixing over significant periods of time and results in much colder water residing near the bottom of the pond. The opposite is typically true in well mixed ponds where much of the depth of the pond is the same temperature and chemical mixing throughout the depth of the pond is higher. The Gulf Island Pond model assumes a contradictory combination of high thermal mixing and low chemical mixing which generates a result of lower dissolved oxygen saturation level and increased chemical decay rates combined with little mixing of oxygen from the surface layers. Simulating this highly improbable condition is one way in which the model is over-conservative.

*Response: The model prediction run at 7Q10 in the evaluation of minimum DO criteria assumes a temperature gradient of about 2 $^{o}$C from the water surface to a depth of 50 feet. This is consistent with what has been observed in the continuous monitoring data and calibration data. The temperatures assigned to the model at 7Q10 flow were derived from an analysis of the continuous monitoring data. The maximum weekly average temperatures that occurred each summer were computed for each monitoring year at the Turner Bridge, Deep Hole, and Gulf Island dam locations. The temperature assigned to the model is the average of the summer weekly maximums. The temperature assigned at locations not monitored directly was derived by a combination of interpolation and best professional judgment.*

*The temperatures assigned to the model at 30Q10 flow followed a similar procedure to the weekly average temperatures at 7Q10 flow except that a 30-day averaging period was applied to the continuous monitoring data at Gulf Island Pond rather than a 7-day average. A temperature of 22 $^{o}$C was used as the ceiling temperature over which significant growth for salmonid fish species is not expected to occur. The 30-day average DO criterion is needed to assure that adequate dissolved oxygen levels exist to support growth of salmonid species. The described analysis of the continuous monitoring data indicates that all of the areas in Gulf Island Pond can be expected to exceed 22 $^{o}$C as a 30-day average in an average summer above the thermocline and hence this was the temperature assigned to the model in all reaches.*

*The actual vertical mixing in the pond is still low and must be assigned as such. The low mixing assigned to the pond occurs frequently every summer. This is evident by observing the vertical DO gradient at the Gulf Island Dam continuous monitors that occur every summer in comparison to the DO gradient generated by the model.*

**7. The model's characterization of organic phosphorus for paper mill effluents does not agree with recent research.**

NCASI Technical Bulletin 879 (2004b) investigated the degradation properties of organic nutrients from pulp mill effluents. The study used treated effluents from four mills representing four different types of pulp manufacturing. This research found that over the 91 day study period, 59 to 68% of the organic phosphorus degraded into the inorganic, available form. The majority of the degradation occurred over the first three weeks of the study while the remaining fraction degraded at a slow rate over the final 10 weeks. The current water quality model lumps organic phosphorus into a single compartment which allows organic phosphorus to decay nearly completely. The most recent state of the science nutrient models such as the Army Corps of Engineers model CE-QUAL-ICM acknowledge a dual compartment characterization of organic nutrients by including both refractory and labile organic nutrient compartments with separate decay rates. The inclusion of all organic phosphorus under a single decay rate may significantly overstate the impact of pulp and paper mill discharges of organic phosphorus on algae growth because it is likely that only a smaller fraction of the organic phosphorus is available for decay over the residence time of the river / pond system.

*<u>Response</u>: As stated in the TMDL report, the organic-P mineralization rate is consistent with literature values. The DEP model does not allow organic-P to completely degrade. It is limited by the river travel time. Only 25% of the organic-P degrades into inorganic-P over the length of Gulf Island Pond in the TMDL prediction runs.*

*The NCASI studies referred to were on paper mill effluent rather than a receiving water. The results from effluents cannot be used on ambient waters. Even if it is assumed that the rates are transferable, the NCASI bulletin indicates that the average organic-P decay rates for four paper mill effluents were 0.112 per day. This is higher than the rate assigned by DEP to the pond (0.05 per day). Hence the DEP rates would be low, not high.*

*A two compartment decay model is more detail than what is needed to calibrate the model. The organic-P mineralization rate is defensible through the calibration and verification of four data sets. NCASI's curves of OP decay in Technical Bulletin 879 use a one compartment model similar to DEP's approach in the river.*

**8. The development of the model's ortho-phosphorus uptake rate is based on incomplete information and needs additional study.**

A key factor in the phosphorus TMDL is the estimation of total and ortho-phosphorus assimilation between point source discharges and the entrance to Gulf Island Pond at Twin Bridges. The draft Androscoggin River Total Maximum Daily Load (2004) report states that 2004 data show "rapid loss of ortho-P" between Berlin and Jay, while "ortho-P appears to remain nearly constant from Jay to Turner implying a low ortho-P assimilation rate" (page 10). Corresponding rates used in modeling, according to the report are "2.3 and 3.5/day, respectively in Berlin and Rumford but as low as 0.01/day from Jay to Turner." The rates for these sections of river differ by more than two orders of magnitude, which the report ascribes to differences in

water depth and the free-flowing nature of the river at these locations (shallower and more free-flowing upstream of Jay). While some differences may exist, we note that estimated travel time (Maine DEP 2002) and elevation change other than at dam locations (based on an analysis of topographic data using the USGS National Map Viewer on-line at http://nmviewogc.cr.usgs.gov/viewer.htm) are not substantially different. In addition, certain characteristics provided in the EPA Reach File hydrographic database for river segments from Rumford to Jay and from Jay to the Nezinscot River are also relatively similar (similar mean depths and mean and 7Q10 flows and velocities). Consequently, it is difficult to believe that such a large difference in phosphorus assimilation rates is real. It is equally plausible that phosphorus sources and dynamics in the river are not yet understood well enough to support reliable predictions of the point source phosphorus loadings to Gulf Island Pond. For example, there may be a higher proportion of agricultural land adjacent to the Androscoggin River in the river reach between Jay and Gulf Island Pond compared to the reach between Rumford and Jay (a brief review of USGS Land Use Land Cover Data and other observations support this). Are there other sources of ortho-P such as agricultural run-off, river sediments, or wetlands between Jay and Gulf Island Pond which could explain the apparent lack of ortho-P assimilation in this river reach?

Further, the only apparent verification of model predictions for phosphorus assimilation comes from observations made between July 21 and August 11, 2004. Verification data consist of four weekly observations at any single point in the river. This is a relatively small number of data points collected over a limited time frame upon which to verify model predictions used to support decisions with such important environmental and economic implications. We further note that the wet, cool conditions of the summer, as pointed out in the draft TMDL report, are not representative of the low flow, warm summer temperature conditions being modeled. We agree with Maine DEP that using data generated during the wetter, cooler period (2004 data) to predict phosphorus utilization during low flow summer conditions when river water travel times and temperatures are higher is problematic. Model predictions for low flow conditions should be corroborated with field data from a period that is more representative of low flow summer conditions before a definitive TMDL is established.

*Response: It is DEP's position that the current information is sufficient to characterize phosphorus assimilation in the river. Refer to responses to Fraser's Paper's comments for more detailed information. It is DEP's position that non-point sources of phosphorus are not significant when compared to point sources during the summer period of non-compliance of water quality standards. Refer to responses to HydroQual's and International Paper's and FPLE's comments for more detailed information.*

**9. It is not appropriate to develop a chlorophyll-a threshold for an algae bloom based upon a single event.**

There is little basis for establishing 10 ppb as the threshold for algae blooms in the TMDL. Page 5 of the report states "There does not appear to be a good relationship between algae blooms and chlorophyll-a at any given location." However, the report goes on to suggest that using "pond averaged chlorophyll-a," "a good relationship is apparent in the chlorophyll-a data and observed blooms." This is based on the observation of a pond average chlorophyll-a value of 10 ppb

occurring simultaneously with a bloom on August 4. This single observation of paired bloom-chlorophyll-a data is not a sufficient basis for a TMDL. The report acknowledges the need for additional data to better link phosphorus and chlorophyll-a levels to algae blooms. It is therefore premature to use a value of 10 ppb to establish a definitive phosphorus TMDL for this system.

*Response: This issue has been previously addressed in responses to Fraser Paper's comments.*

**10. The model's multiple layers of conservative assumptions result in a margin of safety that is undefined and likely overly conservative.**

The model relies on an implicit margin of safety resulting from several assumptions made during in the modeling process. Among these assumptions is selection of the model parameters that resulted in the highest predicted chlorophyll-a concentration for Gulf Island Pond as the basis for the phosphorus TMDL. A higher CBOD decay rate (0.04 per day) was used compared to the 0.03 per day rate that was measured and calibrated from the 2000 modeling effort. All point sources are assumed to discharge their allocated waste load simultaneously during a 10-year low flow event. The report acknowledges that "the probability of this occurring would be low" (page 3). Another conservative assumption is the inclusion of a 0.4 mg/L dissolved oxygen deficit (determined through observation of monitoring data in Gulf Island Pond and not explained by the model) as part of the minimum dissolved oxygen criteria to be achieved by point source reductions. In addition, Gulf Island Pond is characterized as chemically stratified but thermally mixed. While the validity of this assumption is commented on above (see Comment #6), its inclusion represents an additional layer of conservatism. These assumptions compound to create an implicit margin of safety that is undefined, is likely overly conservative, and that may preclude accurate model predictions.

Regarding the margin of safety, the draft Guidance for Water Quality Based Decisions: the TMDL Process (USEPA 1999) states that among the factors that should be considered in evaluating and deriving an appropriate MOS is expressing the results of a TMDL analysis in terms of confidence intervals or ranges. These confidence intervals are not identified in the draft Androscoggin TMDL report. Without a credible effort to establish confidence limits, there are few constraints on the reasonableness of the MOS. An additional factor to be considered according to this draft guidance is the "implications of the MOS on the overall load reductions identified in terms of reduction feasibility and implementation time frames." This information is not provided in the draft TMDL and is warranted given the magnitude of the environmental decision and the potential implications of this TMDL.

*Response: This issue has been addressed previously in responses to Fraser Paper's comments.*

**11. The TMDL for total suspended solids (TSS) is based on incomplete data; therefore it is premature to establish a definitive TSS TMDL.**

As with the CBOD and phosphorus TMDLs, there is a high degree of uncertainty associated with the draft TSS TMDL. For example, the draft TMDL for the Livermore Falls Impoundment aquatic life criteria, which attempts to develop a relationship between point source TSS loads and attainment/non-attainment status of aquatic life criteria, is based on the results of rock basket

studies conducted in several years between 1995 and 2004 (non-point TSS concentrations were assumed to be stable during each period analyzed). The report points out, however, the contrary observation that "[t]he lowest TSS load to the Livermore Falls impoundment occurred in 2002, yet non-attainment of class C aquatic life criteria occurred in that summer." The report later discusses the potential that the non-attainment observation was due to the absence of a "large runoff event that could help flush the bottom of solids that have settled onto benthic organisms" and states that "[w]ithout an additional summer of macroinvertebrate data collected under low flow and low runoff, it is difficult to explain the apparent contradiction of the 2000 and 2002 aquatic life evaluations."

In spite of the highly uncertain relationship between point source TSS loads and attainment of aquatic life criteria, DEP chooses in the draft TMDL report to remove the 2002 data from the TMDL calculation as "an anomaly until more data can be collected at summer low flow conditions that indicate this calculation is incorrect" in order to proceed with the establishment of an aquatic life-based TSS TMDL and point source allocation. In this light, it is reasonable to conclude that any allocation of point source loads to the river will be highly uncertain, and considerably more information is needed before an appropriate TSS load allocation, or the effectiveness of such an allocation, can be determined. We note that without 2002 data, the only other class C aquatic life non-attainment observation for the Livermore Falls Impoundment occurred in 1995, nearly 10 years ago.

Table 12, according to the report text on page 43, contains a "summary of actual loads to the Livermore Falls impoundment." It is not clear how these loads were derived. They appear to be estimates based on model results rather than "actual" load values.

*<u>Response</u>: There is always some uncertainty in modeling and water quality evaluations. This is not enough reason to delay the implementation of water quality improvements on the Androscoggin that have already been delayed for many years. Five years of aquatic life sampling is enough information to set a TSS TMDL. The non-attainment experienced in 2002 may be due to lack of runoff events to flush the Livermore Falls impoundment. Rather than to* set *a TSS TMDL based solely on the 2002 data, which would be about 50% lower for each mill, a phased type of approached is being used that relies on two other years (1995 and 2000) and provides the opportunity for the mills to demonstrate alternate TSS loads that provide attainment or explore hydrologic flushing of the Livermore Falls impoundment.*

*There is a recommendation in the TMDL for International Paper to explore utilizing flushing of the impoundment to avoid a probable lower limit. The 2002 macroinvertebrate data are considered non-attainment and if the non-attainment is repeated at low flow conditions, the paper mills may have to face additional reductions.*

*The loads from Table 12 for point sources were made from the discharge monitoring reports from the paper mills. Non-point source loads were estimated based upon ambient information obtained in 1999, a low flow summer. In any water quality evaluation, it is difficult to measure non-point source loads and estimations are typically made.*

**12. Maine DEP should provide more information on how the recommended "phased" TMDL for CBOD, phosphorus, and TSS would be implemented, including a more detailed monitoring plan.**

We agree with Maine DEP's assessment (see page 4 of the TMDL Summary) that, if a TMDL needs to be established, a "phased" TMDL is appropriate for all TMDL targets on the Androscoggin River and Gulf Island Pond in light of the significant uncertainties in model predictions that remain. However, it is not clear what direction DEP intends to take with respect to such a phased approach. The current draft incorporates several conservative assumptions, resulting in a large undefined MOS and potentially overly restrictive, difficult-to-implement, and potentially ineffective (i.e. fail to fully address true causes of impairments) license limits for point source dischargers. This draft does not, therefore, reflect a "phased" approach.

One element of adaptive implementation, according to EPA Region 1 guidance on nutrient TMDLs for lakes and reservoirs (USEPA 2005), is a monitoring plan "that describes the additional data necessary to determine if the load reductions required by the TMDL will lead to attainment of water quality standards" (page 9). Such a monitoring plan is not currently incorporated in the draft Androscoggin River TMDL.

*Response: While the TMDL itself is final, reflecting best available information, the DEP strongly supports phased implementation. License limits will be set consistent with the default allocations in the TMDL, or revised allocations developed during the permitting process, and compliance schedules will be developed as appropriate. The monitoring plan will be similar to that established in 2004 and be included as requirements in the waste discharge licenses and 401 water quality certification. An outline of monitoring requirements will be included in the final TMDL report.*

## City of Berlin, NH

Letter of February 18, 2005
James A. Wheeler, P.E., Director of Public Works

Based on the limits proposed in your study, we are concerned about our ability to meet these limits without significant capital investments and a significant increase in our operations and maintenance budget. Based on our review of the draft TMDL (December 2004), we offer the following comments:

1. On page 23, it states that "All of the municipal discharges are an insignificant percentage of the total phosphorus entering the pond." It also appears that all of the municipal plants combined are an insignificant percentage of the $BOD_5$ and TSS entering the river. Based on the limited contribution of phosphorus, $BOD_5$ and TSS from the City of Berlin, we question whether the cost burden and growth limitations are justified. If the TMDL is implemented, we believe; that a phased TMDL approach should be undertaken, as discussed on page 4 of the study and that the Berlin WWTF should not receive limits until the final phase provided that there is a need and justification for such limits following the result from the prior phases.

*Response: Agree to phased approach. Final permit limits will be set in the licensing process. It is likely that Berlin's requirement for phosphorus will follow recommendations in the TMDL, which in the first five years will be monitor only.*

2. On page 23, Table 4 shows that 98.4% of the ortho-phosphorus in the Berlin WWTF effluent is assimilated before it reaches the Gulf Island Pond (GIP) entrance. On page 24, the pie charts show that the Berlin WWTF contributes only 0.3% each of the total phosphorus and ortho-phosphorus, respectively that enters Gulf Island Pond. We **strongly** question whether the 1.6% of ortho-phosphorus that is predicted to make it to GIP is within the error of the mathematical model and therefore, question if it is possible that no ortho-phosphorus from the Berlin WWTF effluent ever makes it to the GIP entrance?

*Response: It is possible that no ortho-P from Berlin's discharge enters the pond. It is also possible that some of Berlin's ortho-P enters the pond. The current estimates of assimilation are the best that can be made with available information.*

3. On page 25, the 2004 Discharge data on total and ortho-phosphorus is based on a limited set of data collected by the Berlin WWTF staff and we believe that more data collection is required to determine the actual amount of phosphorus in the Berlin WWTF effluent. Further, we wonder whether the 2004 Discharge data was collected over the same time period and with same sampling frequency from all sources? If not, doesn't this call into question the accuracy of the model.

*Response: - There will be effluent monitoring requirements for phosphorus in the future which will provide additional information. The monitoring frequency is usually undertaken according to the size of the discharge and would not necessarily be the same monitoring frequency for each point source. This is an issue with quantifying point source inputs, not an accuracy issue with the model. The model can consider different point source input levels and their associated impact. It is more important to accurately quantify the larger inputs and hence the increased monitoring frequencies for the larger point source discharges.*

4. If phosphorus limits are imposed, they should only be applicable on a seasonal basis (summer months) as indicated on page 3 of the study.

*Response: Agree.*

## Natural Resources Council of Maine

Nick Bennett, Staff Scientist
February 18, 2005

.**General**

We are generally supportive of the modeling work DEP has done in this report and previously. We also think the report could benefit from some rewriting to make it more easily understandable.

However, we are not supportive of DEP's continued delay in implementing limits to bring the Androscoggin River into compliance with standards The river did not meet standards, either for DO or contact recreation, in the summer of 2004, a very wet and cool summer, so it is clear that significant reductions still need to take place in point source discharges. We believe the TMDL should specify what those reductions need to be for the dischargers, and 38 MRSA 464 clearly gives DEP the authority to do this. We believe that DEP's proposal to negotiate allocations with the dischargers will lead to further delay in cleaning up the river. DEP clearly has enough information to set license limits and needs to move forward. In addition, the McCubbin report clearly demonstrates that the mills can meet any of the limits proposed in this TMDL through affordable investments in efficient and well established technologies.

*Response: The final TMDL contains default allocations based upon impact. Permits will be based on these default allocations unless revised allocations are agreed to in the permitting process. DEP will issue waste discharge licenses by June of 2005.*

**Phosphorus TMDL**

In general, we are concerned that DEP's TMDL may overestimate the amount of phosphorus that can be discharged by the upstream mills without causing blooms in Gulf Island Pond. This is because DEP allows for significant uptake of phosphorus in the river before the pond is reached, sometimes nearly 99% of phosphorus discharged, as is the case for ortho-phosphorus discharged by the Fraser mill. However, where does all of this phosphorus go? Phosphorus is an element and can neither be created nor destroyed. Unless there is a mechanism for phosphorus to be removed from the river above Gulf Island Pond, such as flooding and deposition in floodplains, phosphorus taken up by plants in the river above the pond will eventually move downstream as plants die off, and the ability of plants to take up phosphorus is not infinite. A likely area for this phosphorus to accumulate will be Gulf Island Pond, where it will be available for algae blooms. This underscores at least the need for DEP to be confident in its margins of safety and make sure these are kept conservative and may mean that significantly lower phosphorus limits will be required than those proposed in this TMDL.

*Response: The issue of "disappearing phosphorus" has been addressed in responses to Maine Rivers comments.*

We also have the following more specific comments:

- DEP should provide greater explanation of how it arrived at its trading ratios. Showing the calculations would be helpful.

*Response: The trading ratios are ratios of remaining phosphorus at the pond entrance to International Paper's remaining phosphorus. The calculations are explained in a footnote under the tables containing the trading ratios in the final report.*

- The calculations in Table 6 are also difficult to follow. For example, phosphorus allocations are given in total phosphorus and ortho-phosphorus, but assimilation factors are for organic phosphorus and ortho-phosphorus (a note that OP means organic phosphorus an OPO4-P means ortho-phosphorus would also be helpful to the unfamiliar reader).

*Response: Table 6 is a spreadsheet that contains all of the necessary equations. Your suggestions for improving the readability are helpful. This table will be re-done in the final report to make it more understandable.*

- A column that shows the conversion calculation from total phosphorus to organic phosphorus would be helpful.

*Response: This has been added.*

- The term assimilation factor is confusing. Explaining that this refers to the percent phosphorus remaining rather than the percent phosphorus removed would be helpful, especially given that assimilation refers to the amount of removed previously in the report (P. 23).

*Response: Agree. Column heading has been changed to % P Load Remaining at Twin Bridges.*

- DEP should provide an explanation of the value of 160.4 ppd for the Fraser mill in Step 2, which is difficult to figure out. Also, the assimilation rates for Fraser, Berlin and Gorham in Table 4 do not seem to make sense given their respective distances from Gulf Island Pond.

*Response: The Fraser assimilation rate for organic-P is in error and has been corrected. Table 6 has been re-done.*

- A statement should be added in paragraph 4 on page 14 that HydroQual's rates result in limits for phosphorus loads to Gulf Island Pond that exceed levels known to cause blooms. Therefore, it is not simply that the most conservative rates should be used to preserve the implicit margin of safety, as DEP states, but rather that the rates suggested by HydroQual result in levels of phosphorus known to cause blooms, and that therefore they make no sense to use.

*Response: DEP agrees that the assigned rate for the organic-P decay is necessary to accurately portray ambient conditions and is not a margin of safety. This has been changed in the final report.*

- We do not agree that there is sufficient evidence to attribute the occurrence of algae blooms to increased clarity in Gulf Island Pond (page 2 of the report). It may also be due to increased phosphorus loads compared to historical levels because of changes in treatment strategies by the mills (i.e., increased use of phosphorus to allow more bugs in

the treatment plants in order to treat BOD). We have almost no information on what historic phosphorus loads were to the Pond.

*Response: There is increased clarity within the river and the pond. The secchi depth readings experienced during the studies in the 1980's within the pond indicate that transparency was much lower then without algae blooms as compared to transparency readings during algae bloom conditions now. For example, secchi depth readings recorded in August of 1980 were consistently 1 meter or less when chlorophyll-a was well under 8 ppb. This is due to the higher color and TSS in the river then. In August of 1984, the secchi depth readings ranged from 1 to 1.5 meters when chlorophyll-a was well under 8 ppb. In contrast, during the blooms that occurred on August 4, 2004 and throughout July of 1999, the secchi depth ranged from 1.5 to 2 meters.*

**BOD TMDL**

Regarding the TMDL for BOD, there is no legal basis for DEP to use the 6.5 ppm 30-day average criterion at 22 degrees. The legislature did not pass this standard last year, and it does not exist in statute.

*Response: This issue has been previously addressed in responses to Maine Rivers comments.*

In addition, we do not agree with DEP that the reduction in BOD load that results from cutting Fraser's discharge to meet Class B standards should simply be reallocated to Mead and IP. On page 1 of the TMDL Summary, the report states: "Reduction of carbonaceous BOD, TSS, and phosphorus, is needed to improve dissolved oxygen levels to attainment of class C criteria." Given this, it makes no sense to reallocate BOD removed from the river to other discharges. There is already too much BOD going in to the Androscoggin, as DEP itself notes. Any BOD reallocated to the Maine Androscoggin mills will simply have to be made up for with increased oxygen injection. We believe this would likely violate 40 CFR 125.3(f).

*Response: The default and alternate allocations have been re-done in the final report utilizing an explicit margin of safety of 10% and a clustering factor to account for the collective discharge of mill BOD to the pond. Since the clustering factor is lower than the explicit MOS, the excess BOD described from lowering Fraser Paper's weekly average BOD limit is now assigned to the MOS.*

In addition, we do not agree that DEP has sufficient evidence for it's conclusion on pages 41-42 of the report that the non-attainment in segments 12 and 13 of the model is not real. This non-attainment should be assumed to be real until and unless DEP has very solid data from low-flow, high temperature summers to demonstrate that it is not. Concluding on the basis of last summer's data alone, given the low temperature high flow conditions, that the modeled non-attainment is not real is unjustified.

*Response: The report gives further evidence why DEP believes the model predictions here are not real. This was not a calibration point of the model. Monitoring is recommended in the*

*future as part of the TMDL. The TMDL or oxygen injection requirements can be changed if future data at low flow and high temperature conditions confirm that DO criteria are not met here. Additional data collection is part of any phased TMDL regarding items of uncertainty.*

**TSS TMDL**

Concerning TSS data, we do not believe that DEP has sufficient information to conclude that the 2002 aquatic life non-attainment data are an anomaly. Given that DEP has only five summers' worth of data to use, simply dismissing one of the summers does not make sense unless there is reason to believe the samples were not collected properly. It may be that other, unknown factors interacted with the TSS loads to cause greater invertebrate mortality in 2002. Certainly, the flows were lowest of any of the five years, and the relationship between vulnerability of the organisms to the impacts of TSS smothering and flow may not be linear. Therefore, DEP should not treat the 2002 as anomalous and should use less than 21,279 lbs TSS as the maximum load for the Livermore Falls impoundment.

Even accepting for the sake of argument that the 2002 data are anomalous (and we reiterate that we do not believe there is sufficient evidence to support this), DEP could not allow more than 30508 lbs of TSS for the Livermore impoundment TMDL. 38 MRSA (F) (1-A) states that:

(1-A) The department may only issue a waste discharge license pursuant to section 414-A, or approve a water quality certification pursuant to the United States Clean Water Act, Section 401, Public Law 92-500, as amended, when the department finds that:

(a) The existing in-stream use involves use of the water body by a population of plant life, wildlife, or aquatic, estuarine or marine life, or as aquatic, estuarine, marine, wildlife, or plant habitat, and the applicant has demonstrated that the proposed activity would not have a significant impact on the existing use.

In this case, neither DEP nor any of the dischargers has demonstrated that 35800 pounds per day (ppd) of TSS discharge to the Livermore impoundment will not have an impact on the use of the waterbody by aquatic life. Therefore, even if DEP were to consider the 2002 data anomalous, which we do not believe there is justification to do, the maximum TSS load it could allow to the Livermore impoundment is 30508. However, the Council believes DEP must use a maximum load of less than 21279 ppd TSS for the Livermore impoundment.

*<u>Response</u>: DEP considers five years of data to be a comprehensive amount of data to establish a TMDL. There is one summer of data indicating that the summer TSS TMDL could be as low as 21279. There is also one summer of data indicating that the TSS TMDL could be greater than 30,508 ppd. There are two additional summers indicating that the TSS TMDL could be higher than 21279 ppd. The final summer indicated that the TSS TMDL cannot approach 40,258 ppd.*

*DEP position is that it is premature to set the TSS TMDL as low as 21,279 without a minimum of one additional data set that indicates it needs to be that low. A data set collected under attainment conditions for aquatic life criteria is not limited by the loads discharged during the period of evaluation. The loads could be higher than those experienced and still result in attainment. Conversely, when the result of aquatic life criteria evaluations is non-attainment,*

*the TSS loads measured during the evaluation is not necessarily limiting. Non-attainment can occur when loads are less than that measured during non-attainment summers.*

*In this light, splitting the difference between non-attainment and attainment summers appears to be the best approach. If another summer results with non-attainment at TSS loads approaching 21,000 ppd, the TMDL will be re-evaluated.*

*In addition, an explicit MOS of 10% has been used for the final TSS TMDL . This MOS has been applied uniformly for phosphorus, BOD, and TSS.*

**Dead River TMDL**

DEP asserts that there are sufficient natural and non-point sources to cause non-attainment, apparently both for algae and DO, in the Dead River, but it provides no evidence for this assertion. It seems particularly unlikely that this is the case during low-flow, high-temperature summers when there is little rain to generate significant runoff.

*Response. There is very little gradient on the Dead River resulting in very low reaeration. A strong thermal stratification set up there last summer, despite occasional runoff flow. The resulting stagnation results in low dissolved oxygen levels with very low pollution loads. In low flow situations, the thermal stratification and stagnation would be greater. Even though actual runoff would occur during low flow summers, Androscoggin Lake, the source to the Dead River, would contain pollutant loads from several weeks or months previous to the summer. DEP's agrees that this statement is a professional opinion, and it will be removed from the report.*

## Trout Unlimited

Letter of February 18, 2005. Curtis C. Bohlen, PhD, Restoration Ecologist

I am Dr. Curtis C. Bohlen, presently a restoration ecologist with Trout Unlimited, and an independent environmental consultant. I am writing to provide comments on the Draft TMDL for Gulf Island Pond. I want to begin by stating that I am impressed by the professionalism and the level of effort shown in undertaking the modeling required carrying out the TMDL analysis and to commend you and your staff on your hard work.

**Issue 1: The TMDL is unnecessarily difficult to understand.**

Public participation is an important part of any TMDL and to the permitting processes that depend upon it. In the long run the credibility the regulatory process rests on its transparency and on the ability of citizens and interested parties to understand how regulatory decisions were made. Whenever regulatory decisions rest on complex technical analyses, as they inevitably will on the Androscoggin, it is difficult to ensure that the technical basis of regulation can be understood by lay audiences. However, the Gulf Island Pond TMDL is unnecessarily difficult to follow.

- Key assumptions, methods and results are not described in the text, requiring diligent readers to track down earlier modeling and data reports to understand the logic of the TMDL.

*Critical steps in the analysis must be explained with sufficient clarity so that the structure of the analysis can be understood without reference to other documents.*

- Calculations are not described in sufficient detail to allow readers to understand how the numbers were derived.

  *All calculations and analyses (excluding those part of the formal model run which are described in other technical sources) should be described with sufficient clarity so that an informed professional can reproduce them.*

- Data tables are often difficult to interpret

  *Table legends and headings for columns in tables should be edited for clarity and consistency and relationship to phrases used in the text.*

- Terms and acronyms are often used in non-standard or confusing ways.

  *A glossary and a table of acronyms should be added.*

The modeling effort undertaken by DEP is complex enough to act as a barrier to public participation on its own. The lack of clarity of the TMDL report itself simply exacerbates the situation. The effect is to make the TMDL process on Gulf Island Pond impenetrable all but environmental professionals who can put considerable time into understanding the documents. Such professionals tend to be those who are being paid to provide such analysis, often for the dischargers on the Androscoggin. If DEP wants or expects significant, useful public participation from others, communication of the basis of the TMDL must be significantly improved. DEP should hire a professional technical writer to improve the clarity of the TMDL and to produce a simplified explanation of the analysis for a lay audience.

*<u>Response</u>: A TMDL often contains many reports, particularly when up to five years of effort is involved as is the case on the Androscoggin River TMDL. Rather than investing additional staff time and delays in the TMDL process, prior reports are typically referenced rather than repeating work completed that has already gone through a public review process. Calculations are provided whenever simplified equations are being used to derive the results. For example, Table 6 summarizing the phosphorus TMDL is a spreadsheet containing all the equations used to derive the TMDL. Model input files are provided for anyone who requests them. Acronyms are usually explained throughout the text. There are 11 footnotes in the text to help explain acronyms and the science used in the analysis. Many of tables will be re-done for better clarity.*

**Issue 2: Disappearing Phosphorous.**

By law, TMDL analyses are supposed to incorporate a margin of error to protect aquatic resources. The approach that was taken by Maine DEP in developing the Gulf Island Pond TMDL was to use what are characterized in the report as conservative assumptions to calculate the TMDL, thus providing an implicit margin of safety. However, some assumptions that are apparently derived from the underlying ecosystem models are anything but conservative.

In particular, the Phosphorus TMDL analysis incorporates a term that suggests significant removal of phosphorus from the river by unspecified processes between permitted dischargers and Gulf Island Pond. The rate of removal of phosphorus from the river was apparently estimated by fitting model parameters to match water quality and discharge data from the summer months.

However, phosphorus is an element, and is neither created nor destroyed by ecological or geological processes. Once the phosphorus enters the river, it does not simply disappear; it ends

up somewhere. It is likely that the majority of the "disappearing" P will find its way into Gulf Island Pond where it is likely to exacerbate problems with algal blooms and low dissolved oxygen.

Four dominant processes are likely to account for the disappearance of the phosphorus from the water column. These are (1) uptake pf P by the biota, (2) adsorption of P to sediments (3) chemical co-precipitation of P, primarily with iron and aluminum, and (4) deposition of the P in river sediments onto the floodplain during flood events. Uptake by the biota has a strong seasonal component. Thus significant P is released in the fall and winter as the biomass of aquatic plants and algae declines. Adsorption and co-precipitation of P removes P from the water column, but adds it to the sediments; rivers transport not only water, but also sediments. Again, this transport tends to have a strong seasonal component, with significant sediment transport occurring during high flow events in the spring and fall. However the P that disappeared from the water column during the summer months is still entrained in the river system, still being transported downstream. Only deposition of P-laden sediments on the river floodplain would result in removing P from the pool that will find its way to Gulf Island Pond relatively quickly.

Since Gulf Island Pond is in non-attainment only during the summer months, transport of P into the pond during the colder seasons of the year may appear to be a non-issue. Gulf Island Pond, however, is a depositional environment and is certain to act as an efficient phosphorus trap. A significant fraction of the phosphorus entering the pond will be trapped there where it is likely to enter the sediments, only to be released the following summer when dissolved oxygen concentrations in the bottom waters of the pond decline to near zero.

It can not simply be assumed that phosphorus that disappears from the water column during the summer months is not contributing to non-attainment of water quality standards in subsequent years. Certainly any assumption that P that leaves the water column during the summer months is no longer of concern to Gulf Island Pond (as made in the draft TMDL) is not conservative, and should not be used in an analysis that purports to protect aquatic resources by relying on conservative modeling assumptions.

*<u>Response:</u> This issue has been previously addressed in the responses to Maine Rivers comments.*

*On the issue of phosphorus being trapped within the sediments of Gulf Island Pond and released in subsequent year, DEP does not consider this to be a significant phenomena within Gulf Island Pond. The amount of bottom area containing dissolved oxygen levels of near zero ppm is very small compared to the total bottom area of the pond. If this was a significant issue, algae blooms would be observed during the turnover period in late August. Blooms are not observed at this time.*

**Issue 3: The Water Quality Standard Used in the TMDL is not supported by Statute.**

I have been following the ongoing legislative battles over the shifting dissolved oxygen criteria that apply to portions of the Androscoggin River with considerable interest over the past year or so. I therefore was surprised to see the 6.5 ppm, 30 day average dissolved oxygen concentration standard used in the TMDL analysis is based on D.O. concentrations measured at or below a temperature of 22 degrees C. As I am certain you are aware, that standard is not presently in statute, and has not been approved by EPA. Moreover, it is unlikely to be protective of the

narrative water quality standards, for class C waters in Maine, which require that the waters be capable of supporting trout and salmon.
Trout and salmon are highly sensitive to low dissolved oxygen. Like most poikilotherms, their metabolic demand for oxygen increases sharply with temperature. Simultaneously at higher temperatures, the concentration of oxygen in the water declines. By applying a standard that looks at dissolved oxygen only at lower temperatures the TMDL essentially turns a blind eye to precisely to those conditions most likely to be stressful to trout and salmon.

*Response: Previously addressed. See responses to Maine Rivers comments.*

**Issue 4: The TMDL does not allocate discharges**
By choosing not to tackle the difficult issue of allocating discharges among the mills and other upstream permittees as part of the TMDL, DEP has all but ensured significant delay before the mills are operating on licenses protective of water quality on the Androscoggin. The draft TMDL leaves the difficult negotiations on allocation of discharges essentially to the mills. However, the mills have no incentive to find a solution quickly, and considerable incentive to delay. The longer they delay development of an allocation scheme, the longer they can continue to operate on expired licenses that are less stringent than the ones they will have to operate under after the negotiations are complete.
DEP should issue the TMDL with a preliminary, but binding, allocation of discharges among the mills. Negotiation of a permanent discharge allocation scheme, would then occur against the backdrop of an existing, enforceable set of discharge allocations. That would reverse the incentives faced by the mills, providing them with strong incentive to work out a final allocation scheme quickly.
It should also be pointed out that the idea of relying on a discharge trading scheme (which has considerable merit) does not remove the requirement for an initial allocation of discharges among the mills. Any discharge trading scheme requires two fundamental parts: (1) a limit on the allowable discharges, and (2) clear allocation of rights to those discharges among dischargers. Without a limit, there is nothing of value to buy. But without a clear allocation of ownership of discharge rights, no one has any thing to sell.

*Response: Previously addressed. See responses to NRCM comments.*

**Concluding Remarks**
Once again I thank you for the opportunity to comment on the Androscoggin/Gulf Island Pond draft TMDL. The final TMDL will undoubtedly play a critical role for the foreseeable future in shaping water quality in Gulf Island Pond, as well as on the Androscoggin River both upstream and down of the pond. I very much appreciate the professionalism of your staff and the high quality of the science and modeling that underlies this important effort.

## Androscoggin Lake Improvement Corporation

Letter of February 15, 2005
Molly Saunders

I write on behalf of the Androscoggin Lake Improvement Corporation (ALIC) to comment briefly on the December 2004 *Androscoggin River Total Maximum Daily Load Draft* report

("TMDL"). These comments are limited to the portion of the TMDL that discusses (1) the findings of non-attainment for the Dead River, and (2) the proposed actions by DEP to address this non-attainment. These comments should be read in conjunction with, and incorporate by reference herein, the written comments filed by ALIC with the DEP on December 15, 2004 regarding the November 2004 *Data Report.*

First, in the section titled "TMDL Summary, Description of the Waterbody" (page 1), and then again in section titled "Determining the TMDL, Introduction", mention must be made of the dissolved oxygen non-attainment found last summer on the Dead River. DEP can explain that, unlike for Gulf Island Pond, it believes that insufficient monitoring information is available at this time to determine the cause(s) of this non-attainment and therefore including an implementation plan for the Dead River is premature. However, the summary and introduction sections should note that this Dead River non-attainment is occurring not only on a water body that is very proximate in location to Gulf Island Pond, but more importantly is (1) hydrologically influenced by the River; (2) has a dam on it to minimize impacts to Androscoggin Lake from the same discharges that are being addressed in the TMDL; and (3) the existence of this dam, and the discharges being addressed in the TMDL, may or may not be causing or contributing to the non-attainment in the Dead River and that further study of this situation is critical.

*<u>Response</u>: The TMDL being submitted is for Gulf Island Pond and the Androscoggin River. DEP will treat the Dead River as a separate issue. As it is not yet a listed segment, it should not be included in the TMDL submittal template. A footnote will be added in the TMDL submittal template explaining the Dead River status. More data is needed even to determine its final listing status. DEP appreciates the work that ALIC has done to date on the Dead River and will continue to work on the Dead River.*

Second, regarding the portion of the TMDL titled "Discussion of the Dead River" (beginning on page 46) ("Discussion"), ALIC offers the following comments:

- At the beginning of this discussion, the TMDL should explicitly state that, although there apparently was an absence of a monitored green algal bloom in 2004 (a brown bloom was observed), numerous past green blooms have been observed by local residents during summers with typical summer weather, suggesting under-reporting of this problem with only one year of data.

*<u>Response</u>: Agree. Text has been addedin the final report explaining the issues with algae blooms on the Dead River.*

- Given the acknowledgement in the Discussion regarding how "much more data collection is need to fully determine how the system functions," ALIC strongly objects to the unsubstantiated cause-and-effect conclusions that are scattered throughout this Discussion (see examples below). These conclusions should be removed from this Discussion, and DEP should simply (1) state the information that resulted from the monitoring; (2) state the further information that needs to be gathered; and (3) commit to doing so on a described schedule. For example:

* In the first full paragraph on page 49, DEP offers a definitive conclusion as to the cause of thermal stratification, without conductivity and other needed data;

*Response: No other data is needed to explain the cause of the thermal stratification. It is already known that very little gradient exists on the Dead River other than the dam itself. This information was obtained from discussions with USGS and EPRO. The lack of gradient and water movement is the cause of the thermal stratification.*

- In the last full paragraph on page 49, DEP states that "it is clear that when the Dead River is thermally stratified, natural and non-point pollutant sources would be enough to cause non-attainment of Class B DO criteria," yet DEP acknowledges that it lacks any comprehensive loading data on natural and non-point pollutant sources that would be needed to reach such a definitive conclusion; and

*Response: This sentence has been removed in the final report as stated in the responses to NRCM comments.*

- In the first paragraph on page 50, DEP states that "it is difficult to conclude that point sources contribute significantly to the DO non-attainment," yet DEP has performed no modeling, nor does it understand the system dynamics to make such a conclusion.

*Response: There is nothing wrong with the wording of this sentence which starts "With the data collected to date on the Dead River, it is difficult…" Point source discharges on large rivers do not ordinarily affect water quality on their tributaries. It would take additional data collection and/or modeling to substantiate an unexpected finding here.*

As stated above, the Discussion should be disciplined in abstaining from making conclusions on cause and effect without sufficient information, and should *only* (1) stating the information that resulted from the monitoring; (2) state the further information that needs to be gathered; and (3) commit to doing so on a described schedule.

▶ The information in the second full paragraph on page 50 is both incorrect and creates a highly erroneous impression. The percentages of phosphorus loads estimated by the 2003 DEP study are *projected* phosphorus levels, modeled to occur *after 5 years of maintenance of the 3 foot flashboards*. The percentages in the study are based on the projected level of 10.56 ppb phosphorus. In summer 2003, Androscoggin lake total-P levels were still 15 ppb; the expected decline in phosphorus levels has not yet occurred. The new flashboards were installed spring 2002, and the December 2003 flood broke the boards, which have since been repaired. It is not known whether the boards will hold up or break during the larger floods, whether logs booms will be necessary to protect the boards, or even whether the agreement providing funding for the maintenance of the boards will be signed and implemented

*Response: Some changes have been made to more fully explain the importance of maintaining the flashboards. There is variability of phosphorus levels in Androscoggin Lake from year to year and the levels of phosphorus measured in any given summer cannot necessarily be used to*

*describe what happens every summer. The Lake Assessment section of DEP, who made the lake phosphorus calculations, has indicated that the five year period referred to is not accurate.*

The more important and useful percentages from the 2003 study are as follows: if there were no dam, the projected phosphorus load to the lake would be 25.91 ppb, 72.6% of that from the Dead River during reverse flooding – 65% non-point source and 7.6% point source.

The study demonstrates that the existence and maintenance of the Dead River dam is necessary to avoid serious violations of GPA water quality standards. Therefore, the TMDL should explain that the recommended discharge limits are based on the assumption of the continued existence and maintenance of the Dead River dam.

*Response: Even assuming that the dam is removed, point sources are estimated to be only 7.7% of the phosphorus loading to Androscoggin Lake. There are no plans to remove the dam. The details mentioned in these two paragraphs are best left for a future report on the Dead River.*

- Finally, DEP needs to develop further monitoring and modeling information to know the causes of these known and expected violations on the Dead River, since DEP possesses no credible information right now to demonstrate that implementing the solutions in the TMDL will bring the Dead River itself into compliance. As such, the TMDL should not be discussing (page 50) what DEP "could" do for additional data collection; it should state explicitly that DEP *will* conduct further Dead River monitoring in Summer 2005 and thereafter as necessary, and *will* initiate and conclude a monitoring and analysis process for the Dead River. The Discussion should further state that additional data collection and subsequent Dead River monitoring work will be aimed at identifying the point and non-point causes of last year's violations and any subsequent monitored violations, and that this monitoring should continue as any phased new phosphorous reductions occur in the discharges on the River unless monitoring and modeling conclusively demonstrate that point source discharges of phosphorous into the River are irrelevant to achieving attainment on the Dead River.

*Response: The TMDL for Gulf Island Pond and the Androscoggin River do not address conditions on the Dead River and is not intended to bring the Dead River into compliance with water quality standards. As stated earlier, DEP will treat the Dead River as a separate issue. DEP can not necessarily commit to anything next summer, but the Dead River will remain a high priority project. There will be an opportunity to comment on the sampling specifics in a monitoring plan that will be developed sometime in late spring.*

- ALIC agrees that the scope of the Dead River monitoring should include the four types of data collection described, and we are willing to offer volunteers and/or paid staff to assist with the project whenever possible and appropriate.

*Response: DEP appreciates any help it can get and will be sure to include ALIC or any other entity who wants to participate in the monitoring of the Dead River.*

## New Hampshire Department of Environmental Service

Letter of February 18, 2005
Gregg Comstock, P.E.

Our comments are as follow:

1. **Phased TMDL**: Whenever attempts are made to model complex systems such as the Androscoggin River and Gulf Island Pond (GIP), there is always some degree of uncertainty. In the report, MDEP acknowledges several areas where uncertainty exists in the model and TMDL. In recognition of this uncertainty, DES supports the phased implementation of the TMDL with additional ambient monitoring to allow the ultimate permit limits to be developed iteratively as the available data increases and the analysis evolves. The purpose of the additional ambient monitoring would be to collect data to confirm and, if appropriate, revise the TMDL. We anticipate that several phases may occur for some discharges to, for example, assure that phosphorus uptake rates are well understood as phosphorus limits are set and to ensure that any required upgrades have demonstrable benefit to the river. Phosphorus uptake rates are a particular concern to New Hampshire because of the uncertainty as to the actual impact of phosphorus from NH NPDES permittees on Gulf Island Pond. For example, on Page 7, the report states: "If assimilation of phosphorus is significant, point sources such as the NH discharges that are distant from the pond may contribute very little to the pond's algae blooms." Specifics regarding phasing of the TMDL and monitoring requirements for the New Hampshire NPDES permittees will be the subject of future discussions with permittees involving MDEP, DES and the USEPA.

*Response: The states are in agreement with the phased approach. It is MDEP's position that the current river data are adequate to define phosphorus assimilation rates, although we are not opposed to obtaining more data in the future. We appreciate the assistance of NHDES in improving our knowledge of ambient conditions in the river. The current data results in two independent data sets which satisfies the requirements for calibrating and verifying a model.*

2. **Implementation Plan / Allocations:** On page 4 it is stated that WLA reductions will be implemented through NPDES permitting and a water quality certification for the Gulf Island Pond Dam Hydropower relicensing. DES will be an active participant in discussions and meetings between New Hampshire permittees and the USEPA and MDEP on proposed NPDES permit limits. It is our understanding that some of the New Hampshire permittees may have concerns with some of the proposed allocations, especially those which are not water quality based. For instance, the example phosphorus allocation given in the TMDL is based on a somewhat arbitrary value of 1.5 times the measured phosphorus loadings in 2004; this scenario would result in substantially lower limits than those based on water quality, hence may be too stringent. DES understands that there will be opportunity for adjustments in allocations for specific discharges after discussions with the permittees and/or additional water quality data are available**.**

*Response: DEP is appreciative of the work NHDES has done in coordinating the NH part of this TMDL. We are relying on your role as the state environmental agency to coordinate with the licensed dischargers in NH. Many stakeholders have objected to the high rates of assimilation assigned to some of the point source discharges. It should be kept in mind that an increase to a specific point source in the sample allocations will have to result in a decrease for someone else*

*to preserve the current TMDL expressed as a load to the pond. It is likely that the New Hampshire municipal point sources will have requirements to monitor phosphorus only in the initial stages of the TMDL which should be re-evaluated periodically to determine the appropriateness of limits.*

## Lynne Ramsey
## Patricia Duguay
## Dave Duguay, Oxford County Commissioner

Letter of February 17, 2005. All three letters were identical.

I am writing this letter to provide comments on the draft Androscoggin River Total Maximum Daily Load dated December 2004. As a citizen of Byron, Maine, a County Commissioner for Oxford County, Maine and a member of the Community Advisory Panel, I have a strong interest in environmental issues and the protection of the environment of the Rumford, Mexico, Dixfield, Peru and surrounding region. I appreciate the opportunities provided by DEP for written public comment as well as the public meeting that was held in Rumford which I attended. It was apparent by the large turnout at this public meeting that the local citizens, Legislators and public officials have concerns with this regulatory process and our concerns need to be addressed.

I believe that it is important for this TMDL to be protective of water quality in the Androscoggin River while preserving the viability of the municipalities that depend on the river. DEP can work toward this balance by allowing the affected communities and facilities appropriate time and flexibility to implement this TMDL. This phased implementation will ultimately allow all the regulated sources to make smarter, better decisions while still achieving everyone's goal of improving water quality.

*Response: Agree with phased approach.*

I am also concerned that all issues on the Androscoggin River be dealt with in a fair and consistent manner. It is my understanding that there are sections of the river below Lewiston/Auburn that do not meet State water quality standards, but are not being regulated as part of this TMDL. If our goal is a clean river, our communities should not be held to a different standard than other communities on the same river.

*Response: This TMDL is for an impaired segment of the Androscoggin River that is above the segment to which Lewiston and Auburn discharge. The impairment further downstream results from different causes and is being addressed separately. The water segments below Lewiston and Auburn are listed as category 4(b), which do not require TMDL's based upon the demonstration that other required control methods are expected to result in the attainment of water quality standards. The abatement for combined sewer overflows in Lewiston and Auburn is being implemented through waste discharge licensing and therefore does not need to be included in the TMDL. The CSO implementation period has been established on a case-by-case basis based upon the ability of each municipality to pay. For Lewiston-Auburn a period of 15 years was given to comply with water quality standards.*

It seems apparent that the presence of the Gulf Island dam is a major contributor to water quality issues on the Androscoggin River, yet the draft TMDL does not clearly identify what role the dam owners have in correcting these problems. Since the report clearly details what the mills and municipal treatment plants must do, it seems that the report is incomplete without identifying what the owners of the dam must do as well.

*Response: Modeling results show and the TMDL describes the portion of non-attainment for dissolved oxygen and algae blooms that can be attributed to the dam.*

## MeadWestvaco Corporation

Letter of February 18, 2005
Gary M Curtis, Vice president Maine Operations

- The EPA approved TMDL must include a default waste load allocation – MeadWestvaco believes that the Federal regulations and guidance documents clearly require DEP to include specific waste load allocations for individual point sources. It is indicated on page 3 of the draft TMDL Summary that the allocation by impact methodology is the default allocation method. It is MeadWestvaco's position that DEP must clearly specify in all appropriate sections of the TMDL that the pollutant allocations presented are considered the default waste load allocations. Please refer to the attached legal comments regarding this issue. In addition to the legal aspects of this issue, it is just good policy as part of a public regulatory process, such as a TMDL, to establish clear requirements for all regulated sources. This also provides clear instructions to the DEP permit writer for subsequent development of MPDES licenses. It is also important that all discharge permits and water quality certifications be proposed concurrently so that the obligations of all regulated parties are clearly understood.

*Response: This has previously been addressed in responses to NRCM comments. Default allocations have been included in the final TMDL.*

Impact should be considered - The draft TMDL correctly recognizes that discharges to the Androscoggin River have varying impacts on Gulf Island Pond based on the assimilative capacity of the river segments below each discharge. It is important that DEP continue to consider impact when assessing pollutant allocations in the TMDL and subsequent development of license limits. A methodology based on impact prioritizes the pollutant reductions where they will yield the most environmental benefit.

*Response: Agree. The default allocations consider impact to the receiving water. The four municipal discharges which have a de-minimus impact to water quality within Gulf Island Pond and the Androscoggin River have been allocated technology based limits in BOD and TSS and monitor only for phosphorus in the initial stages of implementation of the TMDL.*

- Provide time and flexibility to implement the TMDL – This TMDL will likely result in the lowest phosphorus license limits for any pulp and paper facility in the nation to eliminate a one-week algae bloom at Gulf Island Pond. A phased implementation of the TMDL is warranted since regulated facilities may be required to make significant investments to achieve these low limits (please refer to the August 2003 three mill phosphorus report). The DEP could construct

the TMDL and licenses in a manner that provides a 10 year implementation. The phased implementation would specify pollutant
reductions, but would also provide opportunity for better information through additional study and opportunities to evaluate the actual environmental results at periodic milestones. This key information could be used to adjust the TMDL during the implementation as needed.

*Response: DEP agrees with most of your comments with the exception of the statement that the blooms in the pond would only occur for a week. In the summer of 1999, for example, blooms occurred for several weeks.*

Do not penalize good performance - It is important that the draft TMDL, allocations, and licenses do not penalize good performance with low license limits and reward poor performance with higher license limits. Allocations and license limits should be based on impact rather than past performance. This approach should be consistent for all regulated parties.

*Response: Agree. DEP does not propose to use current performance as a basis for setting allocations as indicated in both the default and alternate allocations.*

- Consistency within the watershed – This draft TMDL only addresses the Androscoggin River segment upstream of Gulf Island dam. Comments raised at the Lewiston and Rumford public meetings identified river segments downstream of Lewiston/Auburn that also do not meet narrative standards for swimmability; however, these segments are not included in this TMDL. It is our understanding that even after the implementation of this TMDL, the river segment below Lewiston/Auburn will still not be swimmable. It seems that the DEP should be consistent in its approach to meeting these narrative standards throughout the Androscoggin River watershed by aligning priorities and providing a
consistent timeframe for all regulated facilities.

*Response: Previously addressed. See responses to Fraser Paper's comments and responses to Lynne Ramsey, Patricia Duguay, and Dave Duguay comments.*

Current oxygen injection is compensating for mill discharges – The draft TMDL predicts that even if all of the mill discharges and the oxygen diffuser were eliminated, Gulf Island Pond would still not attain Class C water quality standards for dissolved oxygen at deeper depths. As stated in the draft TMDL, other factors affect the dissolved oxygen levels at the deeper depths, regardless of the presence of the mills. The model predictions and the dissolved oxygen observations justify the fact that current levels of oxygen injection are more than compensating for the mills' discharges. MeadWestvaco should not be responsible for the capital or operating cost of any additional oxygen injection proposed for Gulf Island Pond. The current oxygen diffuser is managed by the Gulf Island Pond Oxygenation Partnership (GIPOP). The general partnership agreement specifies that Fraser, MeadWestvaco, and International Paper pay 86% of the operating and maintenance cost of the existing oxygen diffuser. The continuing operation of this diffuser is required by DEP order. It should be noted that the current Partnership is legally responsible only for the existing diffuser and oxygen injection rates as required by the order.

*Response: The current level of oxygen injection actually does not quite compensate for the mill discharge levels specified in the TMDL. If figures 14 and 20 are compared, there are more pond areas in non-attainment of DO criteria predicted by the model with the current oxygen injection and TMDL loads (Figure 14) than the model predictions with the pond at zero discharge and no oxygen injection (Figure 20).*

TMDL Summary, Implementation Plan, Page 4 – As stated above, MeadWestvaco does not believe that any new oxygen injection should be the responsibility of the Rumford Mill, since the current diffuser is already more than compensating for the contribution of the point source discharges. Similarly, DEP has acknowledged that there would be no algae blooms if there were no impoundment.

*Response: As stated above, the mills are not completely compensating for the discharge levels in the proposed TMDL. The model runs assume that the dam will remain in place. At a Stakeholder meeting in 2004, DEP Commissioner Gallagher dismissed dam removal as an option that the DEP will pursue. The model has estimated that the dam is responsible for about 20% of the algae blooms, assuming the dam will remain in place.*

Livermore Falls Impoundment TSS TMDL – MeadWestvaco believes that DEP lacks the technical and legal justification to issue a TMDL for this segment of the river as part of the broader Androscoggin TMDL. There has not been adequate technical study of this issue nor adequate public participation in developing a TMDL for this river segment. As a result, this should be removed from the broader TMDL document. Please refer to the attached legal and technical comments.

*Response: Disagree. This will be discussed further in the appropriate technical and legal sections of your comments.*

Gulf Island Pond TSS TMDL – MeadWestvaco believes that DEP lacks the technical justification to issue a sound TMDL for this segment of the river within the broader Androscoggin TMDL. As a result, this should be removed from the broader TMDL. Please refer to the attached technical comments.

*Response: The TSS TMDL for Gulf Island Pond is needed to assure that the sediment oxygen demand within the pond does not continue to increase from mill discharges. The inputs for annual averages of TSS that paper mills suggested as acceptable rates in a modeling request of April 15, 2003 are used as a starting point. This is discussed further in responses to HydroQual's comments.*

Weekly BOD limits – Although the use of weekly BOD is appropriate for use in modeling, MeadWestvaco does not believe that weekly BOD limits are typical for pulp and paper mill licenses in Maine, nor other pulp and paper mills known to MeadWestvaco. To address this issue, the TMDL could simply include language that would allow facilities to choose between the adoption of the proposed weekly limit or in lieu of the weekly limit, provide DEP with justification for monthly and daily license limits that are equivalently protective.

This letter is intended to identify MeadWestvaco's general comments on the draft TMDL. Please refer to the attached documents for additional detailed technical and legal comments.

*<u>Response</u>: DEP is open to using summer water quality based limits specified as a daily maximum limits in lieu of weekly limits or giving facilities the option of choosing between water quality based weekly and daily limits. This will be added to the report. Daily maximum limits would revert to the current limits assuming a weekly average water quality based limit is specified. A summer water quality based limit, whether specified as a weekly average or daily maximum is much more stringent than current limits.*

## HydroQual

These comments and recommendations are provided for your consideration after reviewing the Draft Androscoggin River Total Maximum Daily Load report dated December 2004.

*<u>Response</u>: DEP appreciates the format followed by HydroQual which makes recommendations at the end of each comment rather than just criticizing DEP's work. Some of the recommendations are very helpful. Many of the comments by HydroQual express the need for additional data or modeling. While DEP does not oppose the collection of additional data or modeling during various phases of the TMDL implementation, the recommendation of more data and modeling is not sufficient reason to delay the submittal and implementation of the TMDL of both Gulf Island Pond and the Livermore Falls Impoundment. It is DEP's position that sufficient data exists for setting TMDL's at both locations.*

*The modeling effort and data collection of Gulf Island Pond has been ongoing for nearly five years now. Aquatic life data collection and analysis at the Livermore Falls impoundment has been ongoing for nearly ten years. The TMDL submittal of Gulf Island Pond has already been delayed a year so that paper mills could collect any data that they wanted last summer. Any data collected in the future will be the sole responsibility of those who are recommending it. DEP encourages the paper mills and others to obtain any additional data or modeling that they feel is necessary. Any monitoring that will be used for regulatory purposes must have a DEP approved sampling plan prior to initiation of sampling.*

### Phosphorus

The approach taken by Maine DEP in the phosphorus TMDL is to reduce the total and ortho phosphorus concentrations below those that were measured entering the Pond at 37 ppb and 9 ppb respectively in July 2004 preceding an algae bloom that was observed by multiple parties on August 4, 2004. The approach also recognizes that the distance of river between each point source and the pond entrance with an appropriate depth and bottom substrate for the uptake of phosphorus by periphyton is an important factor in understanding impact.

Since this TMDL may result in phosphorus license limits that are lower than limits for other pulp and paper mills in the nation, the regulator's discretion to determine the compliance timeline, to use

the modeling work to pursue technically sound yet flexible licensing options, and to remain open to future scientific work of interest to point sources is important.

*Response: Agree*.

# POND MODEL

## *Mineralization Rate*

The report acknowledges the uncertainty of the mineralization rate and chooses a 0.05 per day mineralization rate as part of an implicit margin of safety. HydroQual also acknowledges the uncertainty of the mineralization rate but continues to recommend a rate of 0.02 per day.

The purpose of the eutrophication model is to relate the phosphorus entering the pond and subsequent transformations of phosphorus within the pond to chlorophyll-a observations so that the effects of future phosphorus changes are accurately predicted. The purpose of recommending a 0.02 per day mineralization rate should not be misunderstood as seeking a greater allowable phosphorus load. Rather, the purpose is to accurately model the transformations of phosphorus within the pond so that investments are prioritized as accurately as possible.

A graphical comparison of how the calibrated non-living organic phosphorus compares with the observed non-living organic phosphorus is not included in the TMDL report. The calibration fitwith a 0.05 per day mineralization rate generally decreases at a greater rate than the observations, which is suggestive that the chosen mineralization rate is too great. If true, a consequence of overstating the mineralization rate is that the benefit of reducing total P would be overstated.

The implicit margin of safety chosen for the mineralization rate in this report only provides a certain margin of safety if ortho P reductions are preferentially sought rather than total P reductions. The benefits of ortho P reductions do not rely upon an uncertain estimate of mineralization rate while the certainty of the benefits of total P reductions are completely dependent upon the accuracy of the mineralization rate estimate.

Recommendation: If equally practicable, preferentially pursue reductions in ortho P rather than total P since the benefits of ortho P reductions are known with greater confidence.

*Response: Agree with recommendation. DEP does not agree that an organic-P mineralization rate of 0.02 per day is a more accurate representation of what is occurring in the environment than the rate of 0.05 per day used to develop the phosphorus TMDL. Non-living organic phosphorus is not measured in the field. The measurement of total-P obtained on the pond contained both the living and non-living components and cannot be used to calibrate this parameter.*

May Applicability of P Limits

The TMDL recommends that phosphorus limits apply in May. No narrative observation of algae blooms has been documented in Gulf Island Pond during May or the first week of June. The

chlorophyll-a readings during June 2004 did not pertain to any observable algae in the pond. The prospect of municipal point source phosphorus treatment and/or mills meeting among the lowest total P limits in the nation based on 7Q10 flows and temperatures when flows are multiple times the 7Q10 flow, temperatures are appreciably lower, algae has not been observed, and when non-point source phosphorus far exceeds point source phosphorus is not technically justified. Please note the Androscoggin Lake Report finding that point sources account for a minor contribution of the river phosphorus (approximately 3%) during high river flows. Also, note that the 2002 modeling report statement (p. 43) that the settling of TSS is minimal during the high flow month of May is not consonant with the draft TMDL statement (p.3) that indicates that point source limits are required in May to limit phosphorus buildup within sediments.

Recommendation: Eliminate May from the time period for phosphorus limits. If the burden of May license limits are still insisted upon, then perform the modeling work to derive May specific limits based upon historical worst case flow, temperature, and mixing conditions for the month of May.

*Response: Since the operation of the paper mill treatment plant will be quite different in the summer as compared to the non-summer sufficient lead time is needed so that the plant can be operating effectively in the critical period. The river travel time of up to two weeks could still occur in May. Hence phosphorus discharged in mid May could potentially affect the Pond's water quality in June. DEP agrees that algae bloom problems in May are very unlikely. DEP will change May phosphorus requirement to "monitor only", with the recommendation that the paper mills start their phosphorus abatement in mid-May.*

Municipal & Small Industrial Licensing

The municipal point sources above Jay have a de minimus contribution to Gulf Island Pond and could be modeled at average discharge levels with monitoring requirements only. Since these point sources generally discharge less during low river flow conditions, these point sources could be given a seasonal average (June – September) limit rather than monthly limits with less than the safety factor of 1.5 used in the draft sample allocation. Any licensed point source of phosphorus between Jay and Twin Bridges is important to monitor frequently even if considered only a minor discharge because of the proximity to the pond.

Recommendation: Consider using the mean phosphorus discharge levels in the TMDL for the municipal point sources above Jay in combination with monitoring requirements only for these sources. Alternatively, provide an allocation that these sources can meet with ample statistical confidence that is lower than the draft sample allocation by choosing to limit the seasonal average (June – September) rather than the monthly average phosphorus discharge. Expand the monitoring performed in 2004 to include all licensed point source discharges between Jay and Twin Bridges even if considered only a minor discharge.

*Response: The pie chart diagrams of estimated phosphorus loads to Gulf Island Pond (Figure 10) in the TMDL report indicate that the municipal point sources above Jay (Rumford-Mexico, Bethel, Gorham, Berlin) account for about 2.4% of the total-P and 6.3% of the ortho-P. As the mill phosphorus sources are reduced, and if the towns grow, the percentage of the ortho-P attributable to these discharges will increase. A limit may eventually be needed for ortho-P. DEP is open to making the requirements for these towns as monitor only for the initial phase of the TMDL and using an allocation that is equal to the seasonal average rather than 1.5 times the*

*seasonal average. At the end of the initial phase, the appropriateness of phosphorus limits for these discharges should be re-evaluated.*

Future Monitoring

Additional pond monitoring would add value only after point sources have reached certain milestones to reduce the phosphorus load below this summer's loading. Only 1 week of a widespread algae bloom was observed during the summer of 2004. Future monitoring may indicate that this event was an aberration or tends to occur only in conjunction with a combination of flow, weather, and mixing conditions.

Recommendation: After point sources have been required by the TMDL license limits to reduce phosphorus loads to levels below this summer's load, pond monitoring should initiated using aerial seaplane monitoring similar to the program utilized by MDEP in 2004 to observe for the presence/absence of algae blooms. If no algae blooms are observed during a summer, then maintain the aerial monitoring for 2 additional years to confirm. If a bloom or blooms are observed, then start a more costly and time intensive prearranged water chemistry sampling at several pond stations.

*Response: DEP will not accept a proposal for no ambient water quality monitoring in a phased TMDL (which relies upon monitoring to help confirm the assumptions and predictions of the approved TMDL). Secchi depth, phosphorus, chlorophyll-a, and dissolved oxygen and temperature monitoring will be necessary. The scope of the monitoring could probably be reduced somewhat from the effort in 2004. Since the summer of 2004 was unusually wet and cool, additional monitoring even in the initial phases of the TMDL implementation could give better insight on what to expect in a more critical summer than what occurred last summer. Monitoring requirements will be established in the paper mill licenses and as part of the water quality certification for Gulf Island dam.*

## UPTAKE

The 2004 study data showed appreciable uptake rates of phosphorus in the shallow cobble regions of the river below Berlin and below Rumford. The next few sections discuss the factors that may have contributed to differences in uptake rates, other supporting information, and suggestions for more study if desired.

## Factor Affecting Uptake Rates & Supporting Information

### Geography/Distance & Area

The distance between point source communities and the distance between each community and the pond is significant in understanding the relative impacts. Periphyton uptake requires surface area, so the surface area is important as well.

| River Section | River Miles | Surface Area (sq. ft) |
|---|---|---|
| Berlin to Rumford | 53 | 115,500,000 |
| Rumford to Jay | 23 | 62,700,000 |

| | | |
|---|---|---|
| Jay to Pond | 15 | 40,800,000 |
| Berlin to Pond | 91 | 219,000,000 |
| Rumford to Pond | 38 | 103,500,000 |
| Jay to Pond | 15 | 40,800,000 |

## Substrate Availability & Percent Coverage

While area is a factor in periphyton activity, the availability of and percent of the stream body that has an appropriate substrate for attached algae such as a rocky bottom rather than a sand/silt bottom is a factor as well. The areas below Berlin and Rumford have a rocky, cobble bottom that provides an abundant availability of suitable substrate for attached algae. The substrate between Jay and the pond is not known by HydroQual/Rumford staff. Since periphyton require surface area that is suitable, the surface area of river segments provided in the previous section coupled with the percent coverage with suitable substrate provide an important factor in the opportunity for periphyton growth.

## River Depth & Secchi Depth Measurements

The growth and consequently the phosphorus uptake of periphyton is dependent upon the amount of light (solar radiation) available to the attached algae at the river bottom. The secchi depth measurement is generally accepted to relate to the depth where between 80 to 90 % of the solar radiation is depleted. Only a few locations are available between Berlin and Jay for measuring the secchi depth because the secchi disk generally hits bottom in most locations prior to being at the secchi disk depth. The regions where this summer's data showed that most of the phosphorus uptake occurred were in areas that had mean river depths of only about 1/3$^{rd}$ of the secchi depth. The depth of the Jay – Twin Bridges segment is nearly as deep as the secchi depth, which means that a large majority of the solar radiation is not available for attached algae.

| | **Mean Depth** (ft) | Secchi Depth (ft) | Mean Depth as % of Secchi Depth |
|---|---|---|---|
| Berlin to Rumford | 3.5 | 9.5 | 37% |
| Rumford to Jay | 3.9 | 8.7 | 45% |
| Jay to Pond | 5.7 | 6.2 | 92% |

Mean depth is from the model 7Q10 segmentation and secchi depth is from MDEP 2004 ambient monitoring.

*<u>Response</u>: DEP agrees that light limitation and surface area are important factors in limiting periphyton growth and phosphorus uptake in the river segments from Jay to Twin Bridges.*

## Light Extinction

The decrease of solar radiation with depth is an exponential decrease that is usually characterized by a light extinction coefficient. Acheron measured the light extinction on behalf of the three mills on September 2$^{nd}$ and 16$^{th}$, 2004. The background light extinction coefficient was approximately 1.4 per

meter. The average of the two light extinction profiles taken at the Twin Bridges measured 14 times less solar radiation available at 3 meters than at 1 meter.

## Bottom Solar Radiation

Using the background light extinction coefficient of 1.4 per meter that was measured upstream of the Berlin mill for the entire river length, using the model segmentation at 7Q10 that provides mean depths & river widths, and using 600 Ly/day as a typical value for the ambient solar radiation, it is possible to estimate the relative magnitude of solar radiation reaching the bottom in the different river segments. The differences in distances between point sources (surface area), different depths, and the exponential decrease of solar radiation with depth create notable differences in the total solar radiation available at the bottom of each segment even without assuming differences in the light extinction and differences in percent coverage with suitable substrates between river segments. The solar radiation available for attached algae along the Rumford to Jay stretch is approximately half the solar radiation available along the Berlin to Rumford stretch while the solar radiation of the Jay to Twin Bridges stretch is approximately one-third of the Rumford to Jay stretch.

| Segment River Miles | 7Q10 Depth (ft) | 7Q10 Width (ft) | Solar Radiation Intensity @ Avg Depth (Ly/day) | Solar Radiation @ Avg Depth (kW) |
|---|---|---|---|---|
| Berlin | | | | |
| 135.7 to 131.5 | 3.3 | 327 | 144 | 47173 |
| 131.5 to 126.5 | 4.5 | 242 | 87 | 25101 |
| 126.5 to 120.1 | 4.7 | 430 | 82 | 53886 |
| 120.1 to 113.8 | 3.6 | 278 | 128 | 53071 |
| 113.8 to 103.9 | 2.2 | 477 | 233 | 260708 |
| 103.9 to 90.1 | 3.8 | 385 | 117 | 148264 |
| 90.1 to 80.3 | 3.3 | 486 | 146 | 164778 |
| Rumford | Berlin to Rumford Solar Rad = | | | **752980** |
| 80.3 to 66.9 | 2.8 | 432 | 179 | 245966 |
| 66.9 to 64 | 4.0 | 510 | 108 | 38137 |
| 64 to 58.4 | 5.9 | 519 | 49 | 33974 |
| 58.4 to 55.7 | 5.3 | 626 | 61 | 24581 |
| Jay | Rumford to Jay Solar Rad = | | | **342657** |
| 55.7 to 52.8 | 8.8 | 523 | 14 | 4996 |
| 52.8 to 41 | 4.9 | 526 | 75 | 110093 |
| Twin Bridges | Jay to Twin Bridges Solar Rad= | | | **115089** |

## Afternoon Dissolved Oxygen Measurements Validate Uptake

The Maine DEP afternoon dissolved oxygen measurements validate the appreciable periphyton activity in the shallow cobble stretches below Berlin (Bethel) and below Rumford (Dixfield). The afternoon dissolved oxygen was reliably saturated and often supersaturated indicating consistently high periphyton activity in these areas.

Table of Afternoon Dissolved Oxygen % Saturation During Low Flow

**Calibration/Verification Weeks**

| Town | Mean PM D.O. % Saturation |
|---|---|
| Bethel | 100.7% |
| Dixfield | 104.3% |

Summary Recommendation:
The DEP model assigns greater uptake rates in river segments where measurements of ortho P concentrations decreased and where the fundamentals reviewed above provide a reasonable expectation of periphyton uptake. Since the uptake in the other segments has important implications for point sources, affected point sources should be given the opportunity for additional study within the phased TMDL framework.

*Response: DEP agrees that point source discharges should be given the opportunity to collect additional data for defining phosphorus uptake in the early phases of TMDL implementation.*

## Jay to Twin Bridges – Possibility of Future Study

The Androscoggin River phosphorus measurements taken during the summer of 2004 and the fundamental factors of distance, depth, area, solar radiation, and suitable substrate do not support the assignment of an appreciable uptake rate for the Jay – Twin Bridges segment. Additional study would be valuable to accurately characterize this river segment and to measure any other possible point source and non-point source contributions within this river segment.

Increasing the sample frequency above the once per week used in the most recent study may help to better characterize the magnitude and reliability of the uptake in this river segment.

The sample site below the Jay mill is a vertical composite within the Livermore Falls impoundment. An alternative site immediately below Jay that is well mixed (perhaps turbine piping) and unaffected by vertical velocity and solids profiles/settling may be desired so that the mass balance above/below Jay is satisfied. Presently the mass balance above/below Jay for total phosphorus is not always satisfied making statements of increases/uptake of phosphorus difficult to support with data.

Additional study that indicates an uptake should also validate the uptake estimate with supporting data of periphyton density (chlor a per area or ash-free dry mass per area). Regardless of model framework or coefficient choices, more or less periphyton is an indicator of more or less uptake. Periphyton density in this segment could be compared with periphyton density below the Rumford or Berlin mills.

Additional point/non-point source inputs should be measured directly where possible so that modeled uptake conclusions are validated by data, rather than based upon modeling assumptions of unmeasured phosphorus contributions.

If future sampling is performed, the sampling along this river segment should be supplemented with particulate phosphorus and solids measurements to make sure that particulate phosphorus removed by settling is not mistaken for mineralization of phosphorus or uptake. Additionally, given the light regime in this river segment, samples of chlorophyll-a should be taken to check that phytoplankton is not growing and settling or growing and entering Gulf Island Pond.

Recommendation: The data available at present does not provide a reasonable assurance of a large uptake in this river segment. Since this has significant implications, affected point sources should be given the opportunity to provide more science as part of the phased TMDL. Additional study concerns could include more frequent monitoring, checking for the growth of chlorophyll-a (phytoplankton), checking for the settling of particulate phosphorus, above/below sample points that satisfy the mass balance, benchmarking of periphyton densities, benchmarking the availability of suitable periphyton substrate, and direct measurement of other point and non-point source inputs of phosphorus.

*Response: DEP supports any additional data collection that point source discharges elect to get. Specifically the suggestions for sampling particulate phosphorus, increasing sampling frequency, measurement of chlorophyll-a, and re-location of the Livermore Falls sampling point to below the dam are useful. Although not mentioned by HydroQual, sampling at an additional one or two locations from Livermore Falls to Twin Bridges may also be useful. Collecting data to quantify non-point source pollution is less useful though we are not opposed to this.*

*DEP does not believe that non-point sources of pollution are a significant contributor of phosphorus. A large percentage of the phosphorus of non-point source (NPS) origin is unavailable for algal growth when compared to point source available phosphorus. The discharge of NPS phosphorus is sporadic; the discharge of point source phosphorus consistent. Ortho-P, the most available form of phosphorus, is rapidly utilized and is not typically seen in high concentrations except below point source discharges. Most of the NPS ortho-P is likely assimilated quickly within the tributaries themselves before reaching the Androscoggin River. Lastly, Gulf Island Pond is unlike a lake with a long retention time that can hold pollutants from large runoff events. During large runoff events, NPS phosphorus passes through Gulf Island Pond quickly and there is not enough retention time to develop algae blooms.*

## Uptake Model Framework

The draft TMDL model framework does not model the fundamental periphyton mechanisms but does generally fit the data. More advanced models would require significantly more study and measurements than are presently available for proper calibration. Consequently, some caution should be used when using the model to predict the results from inputs significantly higher or lower than the calibration ranges.

However if a more mechanistic model of periphyton is pursued, extensive additional data is required. At a minimum, measurements of periphyton density in terms of chlorophyll a and ash free dry matter AFDM) would be required at 5 to 10 river stations approximately every two to four weeks during the growing season. In addition a reconnaissance survey of the river would be required to provide an estimate of aerial coverage of periphyton. To better understand the

relationship between periphyton growth and phosphorus uptake, measurements of algal stoichiometry would also be important.

The public domain periphyton models available are weak in their representation of self-shading by periphyton and the representation of changes in periphyton stoichiometry that occurs as water column nutrients are depleted. Because of these weaknesses the reliability of the calculated uptake of river phosphorus by periphyton is questionable. If the uptake of phosphorus by periphyton becomes a critical issue a state-of-the-art periphyton model developed for MeadWestvaco on the Jackson River may be useful.

Recommendation: Inputs that are significantly above or below the ranges used in the model calibration have greater uncertainty in the model outputs. If Maine DEP or stakeholders require a more detailed analysis, then detailed substrate, light extinction, periphyton density, and other data must be obtained so that the results from the more advanced models are not dependent upon unsubstantiated assumptions.

*Response: Although not opposed to this recommendation, DEP believes an effort this large may be unrealistic. DEP would not be able to undertake such an effort with their limited resources and commitment to undertake TMDL's on other rivers. The comment relating to the ranges of model calibration are true for any modeled parameter, yet standard modeling protocol uses parameter inputs achieved in the calibration/verification process for the model prediction runs.*

Rumford QA/QC Check

The sampling and filtering techniques of the three-mill study were crosschecked with sampling and filtering performed by Rumford staff. The Acheron laboratory was used for the analytical measurements. The measurements below demonstrate consistency between the studies with all but one data point being within 1 ppb of each other. The July 28th sample at Riley has a 2 ppb deviation between samples and is flagged with having a greater deviation while the remaining samples have a 1 ppb deviation or less. This comment serves to submit this data.

| | Ortho P Concentration (ppb) Above Rumford Acheron | Ortho P Concentration (ppb) Above Rumford MWV Cross Check | Ortho P Concentration (ppb) Above Jay Acheron | Ortho P Concentration (ppb) Above Jay MWV Cross Check |
|---|---|---|---|---|
| 06/23/2004 | 2 | 1 | 2 | 2 |
| 06/30/2004 | 1 | 2 | 2 | 3 |
| 07/07/2004 | 2 | 1 | 2 | 2 |
| 07/14/2004 | <1 | 1 | 3 | 2 |
| 07/21/2004 | 2 | 1 | 4 | 3 |
| 07/28/2004 | 3 | 2 | 6 | 4 |
| 08/04/2004 | 2 | 2 | 3 | 3 |
| 08/11/2004 | 2 | 1 | 2 | 1 |
| 09/01/2004 | 1 | 2 | 4 | 4 |

Recommendation: One data point is flagged with a greater deviation than other data points in this study. The appreciable assimilation of ortho-P in the Rumford to Riley segment makes quantifying the net impact of this region difficult since most of the measurements upstream of Rumford and at Riley reside within the +/- 1 ppb laboratory precision range from each other. Future monitoring

may wish to split samples between labs to validate the analytical results since the low orthophosphorus concentrations being studied approach the capabilities of the test method.

*<u>Response</u>: Four weekly data points were averaged in the model calibration / verification of the phosphorus uptake rates. The quantity of 1 ppb for 1 of the 4 sampling points at one location is insignificant in the model calibration and verification. The HETL (Augusta state lab) measures phosphorus to 0.1 ppb accuracy. Such an accuracy could be instrumental in fine tuning assimilation rates of phosphorus. DEP is not opposed to using labs other than HETL, but would recommend this higher level of accuracy in future sampling as well as the splits that are recommended.*

## Uptake – Rumford Riley Segment

The model framework describes the benefits of ortho P reductions as being proportional to discharge reductions. The summer study data does not support this relationship for either the Acheron sampled data points or for the MeadWestvaco sampled data points when the ortho P discharge of the Rumford mill was below 120 lb/day. Generally, the ortho P concentration upstream of the mill was steady and the concentration upstream of Jay was 2 or 3 ppb regardless of how much lower than 120 lb/day the mill ortho P discharge was. The correlation coefficients (R^2) for these data points do not indicate with any confidence that reductions in discharges from the Rumford mill below 120 lb/day will result in certain reductions to the downstream (Riley) ortho phosphorus concentration.

| MWV Ortho Discharge Timeframe | R^ 2 With Acheron Sampled Riley Concentration | R^ 2 With MWV Sampled Riley Concentration | R^ 2 With Avg of MWV/Acheron Data Set for Riley Concentration |
|---|---|---|---|
| 1 Day Discharge | -0.149 | 0.065 | -0.006 |
| 2 Day Avg | -0.029 | 0.139 | 0.001 |
| 3 Day Avg | -0.005 | 0.001 | -0.001 |

Recommendation: The model predictions for the Rumford-Riley segment should be utilized with the knowledge that the data does not support a certain benefit in downstream ortho P concentrations by reducing the Rumford mill discharges to the lower end of the summer 2004 operating range.

*<u>Response</u>: It is difficult to draw such a conclusion of non-linearity of ortho-P reductions with the 2004 ambient data. The discharge rate from the MWV mill was rather steady over the entire summer. The ortho-P concentrations below the mill at Riley were not significantly different over the entire summer varying from 1 to 3 ppb. Very short term discharge reductions as experienced in the Rumford mill last summer would not respond the same as long term reductions that would result from implementing the TMDL.*

## *DISSOLVED OXYGEN*

Using the weekly average BOD in the model is an understandable modeling practice; however, the standard practice for issuing waste discharge licenses for the pulp and paper industry is to include only monthly and daily BOD limits.

Recommendation: The TMDL should clearly include language that allows point sources to choose to accept either a weekly average BOD limit or to provide DEP with satisfactory statistical evidence that an alternate daily and monthly BOD limit would satisfy the TMDL.

*Response: Agree. See MWV comments.*

## *OXYGEN DIFFUSER*

## Oxygen Injection Rates

The WASP framework does not model the transport within the impoundment and therefore cannot precisely determine how much oxygen is needed at what locations for compliance to the thermocline. More than one decade of actual data exists that demonstrates compliance in the pond at a depth equal to or greater than the current diffuser. Compliance to the thermocline will require oxygen injection at greater depths in a manner that accounts for the transport characteristics of the pond.

Recommendation: The WASP model cannot and should not be used to specify the oxygen injection rates and locations needed for compliance to the thermocline. The current diffuser has reliably complied with dissolved oxygen standards at depths equal to or above the depth of the current diffuser. Achieving compliance with dissolved oxygen standards at greater depths should be done with oxygen injection delivered to or mixed to these deeper depths in an implementation strategy that is phased and includes monitoring of the dissolved oxygen results.

*Response: Previously addressed. See responses to Fraser Paper comments.*

Diffuser Technology

The members of the GIPOP partnership collaborated on and recently submitted an engineering report to Maine DEP that evaluates in-stream technologies and approaches for dissolved oxygen compliance in Gulf Island Pond. Two technologies that were included were mixers for mixing the water above the thermocline and line diffusers that allow oxygen to be added at specified depths along a length of the pond. If (after the previous comment is considered) graphs of dissolved oxygen compliance and oxygen injection rates are included in the TMDL report, then the technologies included in the engineering report should be included in the draft TMDL so that stakeholders can compare these options since these technologies may require less oxygen injection.

Recommendation: If MDEP continues to illustrate oxygen injection approaches, then include the two innovative approaches suggested in the recently submitted report that may require less oxygen. The effects of the mixing technology could be simulated with the present oxygen diffuser at capacity and simulated with the vertical dispersion coefficients above the thermocline

increased sufficiently for more uniform vertical oxygen profile results. The line diffuser technology could be simulated with the current oxygen diffuser plus delivering the minimum level of oxygen required to a line diffuser that connects from the Lower Narrows to the Deep Hole (segments 24, 30, 36, and 42).

*Response: The diffuser system should be designed so that injection rates can be flexible. The injection rates can be flagged in the TMDL to allow flexibility of a more efficient system than the efficiency assumed in the WASP model of 33%. DEP is opposed to the use of the mixers due to the uniform vertical temperature that would result. Critical cold water habitat would be eliminated by inducing a higher temperature. A primary purpose of this TMDL is to maintain some cool water habitat in the impoundment and to assure adequate DO in that critical habitat for cold water species.*

## *LIVERMORE FALLS IMPOUNDMENT*

The proposal for a TMDL for the Livermore Falls impoundment is new to both HydroQual and the Rumford mill. The basic data to substantiate the claims of the settling of the Rumford mill solids in this impoundment does not exist. The TSS settling rate derived from an analysis of summer 1989 TSS data is not well supported in particular between Rumford and Livermore Falls. In addition the settling characteristics of river solids in 1989 are probably different than current river solids due to improvements in wastewater treatment. Substantiating scientific data is insufficient to proceed with this TMDL.

In addition to the lack of a mass balance to support the TMDL, no consideration has been given to the size of the solids. The presumed mechanism for biocriteria failure is smothering with an excessive volume of solids. Larger sized solids from Berlin or Rumford should preferentially settle with a greater settling velocity resulting in a greater reduction in settlable solids volume than would be otherwise predicted. Similarly, large sized particles in the Jay area would also settle in this location first.

The hydraulics of these impoundments has not been studied and may be important to finding a solution.

Recommendation: This TMDL has insufficient scientific justification to proceed and should not be included in the broader TMDL for the Androscoggin.

*Response: TSS contain particles of many different sizes all of which settle differently. The settling of the river as a whole is simulated in water quality models by the assignment of a single rate. The modeler uses the best available information to calculate a TMDL. The 1989 data are the best available information for calibrating settling rates in the river. No additional scientific information is presented by HydroQual (other than an opinion) to suggest that the settling rates of the river are different now as compared to 1989. A mass balance to the impoundment is not necessary since all of the information to date has suggested that this is a point source and low flow problem. A comparison of point source discharges and attainment / non-attainment status is the information that is relevant.*

*There is good evidence in the five years of existing data that very high discharges of mill TSS such as those experienced in 1995 result in aquatic life non-attainment in this impoundment. DEP is open to additional data supplied by the mills in the future that may result in different TSS settling rates specific to the upper Androscoggin River from Berlin to Livermore Falls.*

## *GIP SEDIMENT TMDL*

It is our understanding that the purpose of considering TSS settling in GIP as part of the TSS TMDL is to reduce the SOD in GIP. Although Maine DEP attempted to estimate the contribution of settling TSS to SOD, this level of analysis is not adequate to support a TSS TMDL. In particular the TSS contribution to pond SOD during high spring runoff was considered negligible, thereby eliminating a potential significant nonpoint source of TSS to GIP. In addition, the effect of settling solids upon pond SOD and GIP dissolved oxygen is being addressed through the addition of oxygen to the pond rather than SOD controls.

Recommendation: This TMDL has insufficient scientific justification to proceed.

*<u>Response</u>: Disagree. HydroQual did not object to the SOD calculations in the 2002 modeling report and it is unclear why they have suddenly changed their position. There is not sufficient residence time during spring runoff conditions for significant settling to occur. Scouring rather than settling typically occurs during high spring runoff. Without scouring, not many of the rivers would have cleansed themselves of bottom sediments so quickly as happened in the late 1970's and early 1980's. The model runs assume an SOD attributable to the mill discharges. The basis for these assumptions is explained in detail in the 2002 modeling report in an entire section of the report (pages 42-51). Without TSS controls, the BOD TMDL and hence mill BOD levels would have to be substantially reduced. There are limitations to relying totally on oxygen injection as a method of achieving DO compliance. The many years of DO data within the pond with the current oxygen system in place support this. The most important reason for having a sediment TMDL is to assure that the SOD rate will not increase in the future.*

## PretiFlaherty

1. Inclusion of Livermore Falls Impoundment – DEP cannot submit a TMDL for the Livermore Falls Impoundment since it is not on the state's 303d list.

*<u>Response</u>: The Livermore Falls Impoundment is on the State's 303d list for 2004. It has gone through a public process. It is listed as category 5a meaning that a TMDL must be completed. It is EPA's position that a TMDL can be submitted for this segment. Additionally, this segment was identified in the 2000 305(b) report as a non-attainment segment.*

2. Waste Load Allocation Requirements – The TMDL is not legal since it does not set specific waste load allocations for each point source.

*Response: As explained in prior responses, the final TMDL does establish default allocations, which will be the basis for permit limits unless revised allocations are developed and approved.*

3. Chlorophyll-a Concentrations – The Department cannot set numeric criteria for chlorophyll-a related to attaining designated uses of water contact recreation without a public participation process.

*Response: The Department has discretion to interpret applicable narrative criteria in order to insure that water quality standards are satisfied. It is frequently necessary to use numerical evaluations to determine whether or not the narrative criteria are met. Maine Law 38 414-A(4) state that "the Department may not issue a water discharge license for any of the following discharges: (4) Discharges of pollutants to any waters of the state that imparts color, taste, turbidity …." Furthermore, 38 MRSA 465 (4) requires that class C waters "shall be of such quality that they are suitable for the designated uses of …..recreation in and on the water."*

*Algae blooms are unacceptable under these narrative criteria. DEP has determined that algae blooms are a condition incompatible with recreational use. DEP has reasonably determined that in order to prevent algae blooms that would violate the narrative criteria, it is necessary to not exceed a pond averaged chlorophyll-a of 10 ppb.*

## Wright – Pierce

Letter of February 18, 2005
Edward Leonard, P.E.

We offer the following comments on the subject document for your consideration:

1. The TMDL uses an "implicit" margin of safety (i.e. that generated from the range of assumptions used in developing water quality models) and very conservative assumptions (e.g. that all point sources discharge their allocated waste load simultaneously during a 10-year low river flow event) for the Androscoggin River TMDL (pgs. 3, 13, 14, 20). The resultant margin of safety is not quantified in the TMDL. The cumulative impact of the numerous conservative assumptions made in the modeling effort may result in a margin of safety considerably higher than the 10-25% explicit margin of safety which the Department has used on other TMDL efforts. An overly large margin of safety will have significant financial impact to the industries and communities along the Androscoggin River. The Final TMDL should quantify and evaluate the resultant margin of safety.

   *Response: Previously addressed in responses to Fraser Paper Comments.*

2. The TMDL states that the "DEP2 [parameter] rates fit the measured chlorophyll-a levels in Gulf Island Pond better for [the July 21 to August 11] data set than HydroQual's rates" and that the "data set resulting in the most conservative model prediction should be used to preserves' DEP's implicit margin of safety" (p.14). Based on a review of Figures 5-8 (pgs. 15-18), the DEP1

parameter rates appear to provide an equivalent or better fit to the measured chlorophyll-a levels during the July 21 to August 11 data set as well as a better overall fit to the whole 2004 data set.

*Response: The DEP2 rates appear to give the best results for the 2004 data which are the more critical data sets, since they occurred under reduced point source phosphorus loading.*

3. The TMDL states that macro-invertebrate sampling is used to determine attainment of narrative aquatic life criteria (pg. 2); however, the outcome of macro-invertebrate sampling performed in the river or the impoundment is not described or referenced in the report.

*Response: The results of the macroinvertebrate sampling are summarized in Table 11 on page 43 of the report.*

4. The TMDL states that "modeling has indicated that 60,000 ppd oxygen injection at Lower Narrows is needed…" (pg. 4). Please clarify whether this is total pounds per day of oxygen delivered or pounds per day of oxygen transferred to the water column.

*Response: This is total pounds per day of oxygen delivered to the water column assuming a transfer efficiency of 1/3.*

5. The TMDL identifies Non-Point Sources as 24.7% percent of the total phosphorus load to the Gulf Island Pond entrance (Figure 10, pg. 24). This is greater than the percent contribution of all municipalities in aggregate and two of the three industries individually. The Final TMDL should identify action items, including monitoring, modeling and/or public outreach, to assess or address non-point sources of phosphorus.

*Response: Non-point source total phosphorus is not a significant issue. (See responses to comments HydroQual, and International Paper for more detailed explanation). The more available form of phosphorus is ortho-P. Non-point source ortho-P is only 0.5% of the total load to Gulf Island Pond (Page 24, Figure 10 of TMDL report).*

6. Additional language is needed to clarify the allocation methodologies. Some specific questions include:

*Response: Tables 4, 5, and 6 have been re-done with better explanation given in the final report.*

- Table 6, Step 1 - What is the source of the Total Phosphorus and Ortho-phosphorus values used in the 2004 Discharge columns? These values do not seem to match Figure 18 or 19 from the draft report entitled "Androscoggin River and Gulf Island Pond Data Report", dated November 2004.

  *Response: All values match except International Paper's ortho-P which has been corrected in the final Data Report to the value in the TMDL report.*

- Table 6, Step 2 - Why is the "Phosphorus Allocation Outfall" for TP for Fraser shown as 160.4 ppd versus 199.5 ppd shown in Step 1?

*Response: As explained in the responses NRCM comments, table 6 and some of the other tables will be re-done with better clarity and explanations.*

- Table 6, Step 3 - How was the Reserve Capacity re-allocated? It does not appear to have been allocated equally.

*Response: The reserve capacity is initially re-allocated so that point source discharges can receive 1.5 times their 2004 discharge rate whenever possible.*

- Tables 8 and 9 - The differences between the original 4/15/03 Run, Allocation 1 and Allocation 2 is not clear.

*Response: Note that allocation 1 is the default allocation and allocation 2 is an alternate allocation in the final report. This is explained in the text on page 28. The default allocation uses the loads generated on 4/15/03 as an initial basis and the alternate allocation uses impact as an initial basis. Fraser's weekly average allocation of BOD must be reduced to meet minimum class B DO criteria on the Androscoggin River in Table 8. The reduction in Fraser's BOD5 is re-allocated to the explicit margin of safety in Table 8. The default allocations in table 9 are based upon the 4/15/03 loads but reduced by about 8% which is re-allocated to the explicit margin of safety. The alternate allocations for IP and MWV are based upon impact.*

Wright-Pierce has a working knowledge of the State of Connecticut Nitrogen Credit Trading Program. If, after the final allocations are determined, the point source entities express interest in this approach, Wright-Pierce would be willing to provide a seminar/workshop to the Department and the interested point source entities to discuss the options/details of Phosphorus Credit Trading.

## International Paper

Letter of February 17, 2005
Nehl Aldridge
Manager, EHS
Coated & SC Papers

As a large manufacturer and employer located on the Androscoggin River upstream from Gulf Island Pond ("the Pond") and the Livermore Falls Impoundment, International Paper has a significant interest in the development and implementation of a scientifically defensible and equitable Total Maximum Daily Load (TMDL) for these waters.

While International Paper recognizes that DEP is under a self-imposed deadline to issue this proposed TMDL, the company strongly objects to finalizing the proposed TMDL without significant changes. As discussed in greater detail below, the proposed State of Maine, Department of Environmental Protection ("DEP" or "the Department"), Androscoggin River Total Maximum Daily Load for Gulf Island Pond and Livermore Falls Impoundment, prepared by Paul Mitnik, dated December 2004 ("the draft TMDL"), is scientifically unsound and without adequate basis in fact or law. International Paper reserves its right to provide further comment on any revised or alternative TMDL.

Under aforementioned objection and reservation of rights, International Paper submits the following comments on behalf of the International Paper mill located in Jay, Maine.

**INTRODUCTION**

International Paper is vigilant in its efforts to protect water quality and is committed to assuring that water quality in the Androscoggin River is appropriately protected. We further recognize that water quality protection is critical to the viability of our multi-million dollar assets in the State of Maine; hence it is critical that the TMDL accurately reflect the current hydrodynamic regime and physical setting of Gulf Island Pond and the Livermore Falls Impoundment and that the TMDL be based upon a water quality standard that defines the appropriate level of protection necessary for those waters.

DEP admits in the draft TMDL, and rightfully so, that more monitoring and analysis is needed to better understand the dynamics of this complex river system and to design a sound strategy for sustained attainment of water quality standards. The admission stands on its own: the issuance of a final TMDL at this time is premature and inappropriate.

The comments below describe deficiencies in the draft TMDL and recommend remedies and options that will make the draft TMDL more scientifically sound. The Department recognized some of the deficiencies in the draft. The comments elaborate on those and identify additional deficiencies that must be considered by the Department as it determines what level of control is justifiable in the first phase of implementation and what data will be needed for any subsequent phases.

International Paper primarily focused our comments on the scientific questions that will have a significant impact on the TMDL's effectiveness. We also raise underlying policy concerns that should be addressed more clearly prior to finalizing the TMDL, especially when one considers the profound and lasting societal impact of the TMDL. The employees of International Paper and their fellow Maine citizens should not bear the burden of a costly and ineffective "solution" for the river that creates more problems than it solves. At the very least, and as DEP has recognized, a phased approach to developing a realistic final TMDL is the proper, practical and defensible plan for implementation of the TMDL.

*Response: It is DEP's position that enough data collection and modeling evaluation has been undertaken to set a TMDL in a phased approach. There will be opportunities for the point source discharges to collect additional data or undertake additional modeling in the future if*

*they so desire. Point source discharges will have some ambient monitoring requirements in their waste discharge licenses which will be set at a future date.*

## IMPLEMENTATION PLAN

Faced with uncertainty and lacking critical data, the Department has proposed a "phased implementation" approach for the TMDL. If DEP must issue a TMDL at this time, **International Paper strongly concurs with the Department that the process move forward in distinct phases, thus allowing for reassessment, recalculation and revision with each successive phase.** As EPA states in its 1991 Guidance for Water Quality-Based Decisions:

> This [phased] TMDL requires additional data to be collected to determine if the load reductions required by the TMDL lead to attainment of water quality standards. Data collection may also be required to more accurately determine assimilative capacities and pollution allocations.

EPA's 1999 Protocol for Developing Nutrient TMDLs (p.1-5) offers this further guidance:

> TMDL submittals should include a monitoring plan to determine whether the TMDL has resulted in attaining water quality standards and to support any revisions to the TMDL that might be required. Follow-up monitoring is recommended for all TMDLs, given the uncertainties inherent in TMDL development. The rigor of the monitoring plan should be based on the confidence in the TMDL analysis: a more rigorous monitoring plan should be included for TMDLs with greater uncertainty and where the environmental and economic consequences of the decisions are greatest.

As more thoroughly discussed below, there is significant uncertainty and potential inaccuracies in the proposed phosphorus, TSS and BOD maximum loadings to Gulf Island Pond, and for the proposed TSS load to the Livermore Falls Impoundment. There simply is not the level of data and knowledge necessary to impose such far reaching and aggressively conservative TMDLs. International Paper urges DEP not to finalize the draft TMDLs given the state of the data at this time. Rather, per EPA's recommendations, a phased approach should set interim goals that can be coupled with an implementation plan to evaluate the success of each individual phase of implementation. If attainment with water quality standards is achieved, for example, at the end of the first phase, then there will be no justification to pursue continued loading reductions or further restrictions on the River. It is simply inconsistent to adopt a "final" TMDL before allowing a phased implementation program to progress.

## GULF ISLAND POND TMDL FOR PHOSPHOROUS

The most significant impact of the draft TMDL is on the levels of phosphorous loading deemed acceptable for Gulf Island Pond. International Paper recognizes and appreciates the efforts of the Department to reach what it perceives to be an acceptable loading limit for phosphorus. Unfortunately, more time and further study is necessary in order to sufficiently understand this water body in order to reach a scientifically defensible limit for phosphorus. Given the significant potential economic and societal ramifications of the TMDL, incomplete science

should not be acceptable. Too many scientific and policy questions regarding phosphorous remain unanswered in the draft TMDL.

Among the scientific questions are:

- What objective measures determine if an algal bloom is occurring or is about to occur?

*Response: The TMDL has set a pond averaged level of chlorophyll-a of 10 ppb to define an algae bloom. In the future, observations of bloom will be used to define levels that are specific to Gulf Island Pond*

- How much phosphorus must be present in Gulf Island Pond before an algal bloom occurs?

*Response: This is specific to a number of items such as temperature, flow, meteorlogical conditions, and phosphorus form. Threshold levels are defined for given worse case conditions in Table 3 on page 20 of the report.*

- What is the relative importance of phosphorus vs. light intensity considering the reductions in color in the river (i.e., will algal blooms increase due to color improvements)?

*Response: As light intensity increases, the pond will become more sensitive to algae blooms. There is no indication that river color will diminish significantly from what has already occurred. There are no further requirements for color reductions from the mills. Hence light intensity should remain similar to current levels in the future.*

- What is the influence of Pond flushing on phosphorus accumulation in the Pond and phosphorus releases from the sediments?

*Response: There is no indication the phosphorus in the sediments is a significant contributor to algae blooms due to the small bottom area associated with low dissolved oxygen levels within the pond. Hence DEP does not believe this is a relevant issue.*

- How does the form of phosphorus influence algal blooms?

*Response: See Table 3, page 20 of TMDL report and underlying text.*

- How do dam control operations influence algal blooms?

*Response: The store and release mode of operation of Gulf Island dam are not specifically long enough to affect algae blooms.*

- Is the WASP model sufficient for understanding the dynamics at work in the Pond?

*Response: Yes. Addressed in more detail throughout responses to IP comments.*

- What are the sources of the phosphorus – both point and non-point?

*Response: See Table 6, page 26 of TMDL report.*

- How is phosphorus cycled and assimilated throughout the river system?

*Response: Explained in detail in pages 7 to 22 of the TMDL report.*

- What control or mitigation strategies are available and how efficacious are they?

*Response: This is a very vague question, but in the opinion of DEP, control of phosphorus at the source or by reducing point source inputs will always prove to be the most effective strategy that has the largest chance of success.*

*Response: It is DEP's position that all of these questions have already been answered in the current modeling analysis which has involved nearly five years of DEP staff time. The current modeling analysis has already accounted for the mentioned parameters as indicated by the responses under the bullet items.*

Policy questions include:

- Does Maine's existing water body classification system account for the unique nature of Gulf Island Pond?

*Response: A TMDL does not consider changing the classification unless undue economic hardship is triggered. In this case, A UAA would have to be undertaken. DEP is following an alternative that is affordable and results in full attainment of class C criteria.*

- What aesthetic values govern a Class C water body?

*Response: Maine law (Title 38 &464 4 A(4) ) prohibits issuance of a waste discharge license for pollutants that impart color, taste, turbidity, toxicity, radioactivity or other properties that cause those waters to be unsuitable for the designated uses and characteristics abscribed to their class.*

- Under what circumstances is a Class C water body rendered "unswimmable," due to the presence of algae?

*Response: The occurrence of an algae bloom has been consistently interpreted by DEP in other TMDL's already approved by EPA as not meeting designated uses of water contact recreation. The Androscoggin River TMDL is consistent with other TMDL's.*

- What priority should be assigned to this aesthetic issue, versus health issues (such as the presence of e-coli bacteria from combined sewer overflows)?

*Response: All water quality non-attainments issues must be corrected as required by the Clean Water Act.*

- What level of certainty is needed in the underlying science before the relative costs and benefits to society can be appropriately weighed?

*Response: This is a vague question. The TMDL phased approach allows data collection during implementation, so potentially a point source discharger can satisfy their desired level of effort. There will always be some uncertainty as to the level of reductions necessary no matter how much data and analysis are undertaken. DEP's effort that has taken nearly five years is sufficient to set a TMDL. A cost-benefit analysis is generally undertaken in a UAA, not a TMDL.*

That these questions are either not addressed at all or are inadequately answered in the draft TMDL lends further support to International Paper's contention that a final TMDL is premature. International Paper urges DEP to respond to these important issues before finalizing the TMDL and to reissue another draft TMDL.

*Response: DEP has no plans for reissuing another draft TMDL. The current analysis is sufficient.*

***The draft TMDL fails to establish objective measures to determine if an algal bloom is occurring.***

The draft TMDL attempts to set a reasonable objective measure for algal blooms. Unfortunately, the Department has not presented a good scientific case for its conclusion that algal blooms are directly associated with chlorophyll-*a* values of 10 ppb or greater.

EPA's Protocol for Developing Nutrient TMDLs (First Edition, 1999) describes chlorophyll-*a* as "a valuable surrogate for algal biomass." A number of case studies appear in the document, among them development of a TMDL for the Tualitin River and the lake into which the river flowed. For that water body, which is similar to the Androscoggin River and Gulf Island Pond, Oregon used 15 ppb as the applicable chlorophyll-*a* numeric criterion to identify where phytoplankton may impair uses. EPA's guidance document also states that North Carolina uses a target of 15 ppb for cold waters and 25 ppb for warm waters, which we would advocate is more similar to Gulf Island Pond. According to EPA, a value of 25 ppb also has been proposed as a criterion for water bodies primarily used for viewing pleasure, safe swimming, fishing and boating.

These criteria presumably were not derived from observations and data taken during a single event (i.e., one bloom in one summer). The Department should recognize in its final report that it is highly premature to set a chlorophyll-*a* threshold of 10 ppb as an indicator of a widespread algal bloom. According to the 2004 Androscoggin River Data Report, "[g]iven the data this summer, there does not seem to be a consistent relationship between elevated chlorophyll-*a* readings and the visual observation of algae blooms." The draft TMDL report makes a similar observation: "There does not appear to be a good relationship between algae blooms and chlorophyll-*a* at any given location." The draft TMDL further states that "water quality trends are difficult to describe with only one summer of data under reduced phosphorous loading." However, notwithstanding their admission as to the uncertainty of their data, DEP then concludes that when using "pond averaged chlorophyll-*a*", "a good relationship is apparent in the chlorophyll-*a* data and observed blooms." As discussed below, this statement is wholly unsupportable.

According to the 2004 Androscoggin River Data Report, there was one widespread bloom observed in 2004 – on August 4, and the bloom "extended from Lower Narrows to the Deep Hole." At this point all the Department can confirm with any certainty is that on one occasion a bloom occurred in a portion of the Pond when the pond-averaged chlorophyll-*a* was 10 ppb. The Department is not justified in stating that there was a direct and recurring "relationship" between the bloom and the measured pond-averaged chlorophyll-*a*. There is no relationship in the scientific or statistical sense, and pairing a single bloom to a handful of chlorophyll-*a* data simply is not an appropriate basis for establishing a TMDL with highly conservative maximum loadings. The pond-averaged value was calculated from a single day sampling event with very few data points, and 4 out of the 6 data sampling locations were in areas of the Pond without a

bloom. If the Department is intent on setting a chlorophyll-*a* threshold based on the average of a limited number of data points, the Department should select the average of the chlorophyll-*a* measurements on August 4 that were taken in the bloom's actual location. Data points outside the location of a bloom are not relevant other than to demonstrate that no bloom exists at those values. The average chlorophyll-*a* value at the location of the bloom on August 4 was approximately 15 ppb. While this number is also statistically suspect, it is certainly more defensible than an average value calculated from sample points at which there was no bloom.

In summary, the DEP's arbitrary decision in its draft TMDL to set 10 ppb as the chlorophyll-*a* threshold for nuisance algal blooms is flawed. Because the Department has acknowledged that additional data is essential to better link chlorophyll-*a* levels to algal blooms, in the first phase of TMDL implementation, the Department should continue to analyze the chlorophyll-*a* threshold for reduction of algal blooms in Gulf Island Pond. Further scientific study and rulemaking may be later initiated to set an appropriate threshold once scientifically defensible data is collected and analyzed.

*Response: This issue has previously been addressed in the responses to Fraser Paper's comments. Chlorophyll-a eutrophy impairment levels in EPA's Nutrient Criteria Technical Guidance manual are 8 ppb not 15 ppb. A value of 15 ppb is cited as an "action level." DEP is not clear what is meant by an "action level" but would not ignore impairments that would occur at levels much lower (8 ppb) and propose to use levels more similar to the impairment level. A value of 8 ppb is also consistent with the value DEP has been using in colored lakes for more than 20 years. Hence the 10 ppb level set by a single bloom condition is consistent with literature values. There will be additional data collected as license requirements for the mills and FPLE to attempt to set something that is specific to Gulf Island Pond as was done last summer.*

*DEP considered using chlorophyll-a levels within the bloom area to define a threshold goal, but believes the procedure described within the TMDL is more scientifically defensible. The data from 2004 contain occasional "scatter points" or individual high chlorophyll-a readings at specific locations that are not always supported by adjacent locations. The averaging of just a few data points rather than five data points could result in placing more reliance on scatter data points. DEP disagrees that the data points outside the bloom are not important considerations for defining the bloom. A gradual buildup of chlorophyll-a is apparent during a bloom condition, so it is important to include the data at many locations. It may not always be possible to define exactly where the boundary of a bloom that is occurring within the pond is another consideration in this approach. And the final consideration was that the averaging of limited chlorophyll-a levels that have individually already exceeded a threshold is not a good method of describing a desired threshold. It is good to include some points in the averaging method which have not individually exceeded that threshold. When these many points are considered, DEP would disagree that their decision was arbitrary and flawed as suggested by IP.*

***The draft TMDL does not adequately explain how much phosphorus must be present in Gulf Island Pond before the chlorophyll-a threshold is reached.***

The draft TMDL fails to adequately address or substantiate its conclusion regarding the correlation between phosphorus loads to the Pond and chlorophyll-*a* levels.

EPA's 1999 Protocol for Developing Nutrient TMDLs references research completed in Oregon that indicates a relationship exists between chlorophyll-*a* and phosphorus levels. For that study Oregon researchers noted that values between 50 and 100 ppb Total Phosphorus (TP) are sufficient to limit Chlorophyll-*a* to a level below 15 ppb. Ultimately Oregon chose a threshold level of 70 ppb TP as the target threshold for its river impoundment. Maine DEP has chosen a value of 35 ppb as indicative of a chlorophyll-*a* level of 10 ppb and an impending bloom. In light of this research, the value DEP selected is extremely conservative.

Only after the relationship between phosphorus levels and chlorophyll-*a* is understood through a phased TMDL process can a scientifically defensible phosphorus load be established. If during this phased process the concentrations of phosphorus moving to and from the Pond (from point and non-point sources as well as from conversion to orthophosphate and from the sediments) can be determined, an appropriate balance can then be developed. The draft TMDL recognizes that "[a]s additional data are collected on the Pond in the future, more information should be provided to more precisely define the relation of phosphorus loading to algae blooms."

Clearly, the chlorophyll-*a* and phosphorus concentrations currently set forth in the draft TMDL are not fully supported by sound science and are therefore arbitrary. The only sure method to accurately determine the chlorophyll-*a* level and the corresponding phosphorus concentration necessary to foster an algal bloom is through a long-term program of sampling and analysis of these compounds. International Paper urges DEP to pursue this approach.

*Response:* *IP's recommendation in the final sentence is flawed, since there is no one level of phosphorus concentration that can be used as a threshold for bloom conditions. The combination of ortho-P and organic-P loads determine bloom conditions. A number of factors such as residence time, temperature, flow, meteorological conditions, and available light penetration similarly affect whether or not a bloom occurs. In Gulf Island Pond vertical mixing conditions are also a large consideration. The pond is much more sensitive to phosphorus loading during a low mixing event. The concentrations for ortho-P and total-P used in the TMDL at Twin Bridges represent a critical condition of low flow, high water temperature, and low vertical mixing.*

*Relationships between phosphorus and chlorophyll-a are already well understood and investigated within the report. Table 3 in the TMDL report (p 20) gives a default combination and three other possible combinations of ortho-P and total-P that could be acceptable. In addition, Figure 9a (p21) illustrates model predictions of chlorophyll-a at the level of zero discharge, the TMDL, and current discharges. There is already enough available information to indicate that a level of 70 ppb for total phosphorus is much too high. Historic levels of total phosphorus were that high and this resulted in frequent algae blooms. Lastly, a TMDL for phosphorus must be expressed as a load, not a concentration.*

***The inadequate consideration of non-point source phosphorus invalidates the calibration of the WASP model and its output.***

In its 1991 Guidance for Water Quality-Based Decisions, EPA states:

> The total pollutant load to a waterbody is derived from point, nonpoint, and background sources. Pollutant loads may be transported into waterbodies by direct discharge, overland flow, ground water, or atmospheric deposition. The TMDL concept has successfully been applied to develop wasteload allocations for point source discharges in low flow situations where nonpoint sources are not a concern. TMDLs can and should be used, however, to consider the effect of all activities or processes that cause or contribute to the water quality-limited conditions of a waterbody.

To simplify the process of developing a TMDL for phosphorus, the Department attempted to calibrate and verify its model to correspond with low flow conditions, where non-point sources presumably are not of concern. However, the Department was candid in its summary of the problems its approach presented, given the limited dataset:

> The summer of 2004 was cool and wet and was not ideal for judging critical water quality conditions that are ordinarily experienced in dry and warm summers…. Many runoff events occurred in 2004.

The Department also notes that other model runs used in calibration – based on 1998 and 2000 data – "also had the disadvantage of being collected in relatively wet summers involving undesirable runoff conditions." Yet nowhere in its report does the Department address the potential influence of non-point sources on phosphorus levels and algal blooms in the pond.

Regarding the 2004 algal bloom, the draft TMDL attributes the bloom predominantly to inputs from point sources and ignores the possibility that the relatively high proportion of agricultural land adjacent to the Androscoggin River in the river reach between Jay and Gulf Island Pond – and adjacent to the Pond itself – may be responsible for some of the phosphorus loading to Gulf Island Pond under certain conditions, such as those present in 2004. Nor were other non-point sources such as sediment or atmospheric loading addressed.

DEP further states on page 7 of the draft TMDL:

> Data considered most useful for model calibration are low flow and high water temperature periods with no significant runoff prior to and during sampling. For the summer of 2004 this was difficult due to numerous runoff events that occurred throughout the summer.

Rather than admitting that numerous runoff events in 2004 made accurate calibration and verification of its version of the WASP model impossible, the DEP elected to rely on inappropriate data sets and used incomplete or misleading information to justify the use of the data. Figure 2 illustrates the river flow at Rumford, some 60 miles upstream of the pond. As shown in draft TMDL, Figure 2, data set #1 includes four sampling events that ranged from June 16 to July 7; data set #2 consists of four sampling events that occurred from July 21 through August 11. The figure implies that runoff from local rainfall events was not a significant factor

that could influence model accuracy during these two periods. However, if the DEP had included local rainfall data available for National Weather Service and other sources in its analysis, it would have been obvious to DEP that significant runoff in the vicinity of the Pond likely occurred during both these periods.

For example, the following localized rainfall events were recorded at the Livermore Falls weather station (NOAA Coop ID 174745) during the time periods used for calibration and verification of the phosphorous assimilation rates.

| **Calibration Period** | | **Verification Period** | |
|---|---|---|---|
| June 20 | 0.40” | July 21 | 0.31” |
| June 23 | 0.20” | July 24 | 0.28” |
| June 26 | 0.07” | July 28 | 0.22” |
| June 27 | 0.41” | Aug 1 | 0.26” |
| June 29 | 0.14” | Aug 2 | 0.21” |
| June 30 | 0.21” | Aug 4 | 0.16” |
| July 2 | 0.38” | Aug 8 | 0.14” |
| July 6 | 0.20” | Aug 11 | 0.03” |

As shown by this data, measurable precipitation frequently occurred in the local watershed region. But, DEP disregarded or never sought to obtain such data.

In addition, unofficial data gathered at the North Jay wastewater treatment facility indicates even more extreme, localized precipitation during the verification period:

| **Calibration Period** | | **Verification Period** | |
|---|---|---|---|
| June 19 | 0.4” | July 17 | 0.6” |
| June 21 | 0.1” | July 18 | 0.3” |
| June 25 | 0.1” | July 19 | 0.1” |
| June 26 | 0.1” | July 20 | 1.2” |
| June 28 | 0.1” | July 23 | 1.8” |
| July 1 | 0.1” | July 27 | 0.1” |
| July 5 | 0.2” | July 31 | 1.0” |
| July 7 | 0.1” | Aug 3 | 0.4” |
| | | Aug 6 | 0.1” |
| | | Aug 11 | 0.2” |

The significant differences in precipitation amounts between these two nearby locations illustrate that frequent, intense and geographically limited showers occurred during both the calibration and verification periods. It is also evident that there was little relationship between several significant rainfall events in the vicinity of the Pond and the river flow at Rumford, which is much more distant from the Pond.

Because the WASP model was calibrated without any non-point source inputs and without a consideration of the influence of localized runoff from the showers that occurred during the calibration and verification periods, the model results are not representative of real world

dynamics. Therefore, the proposed phosphorus TMDL that is based on that data is not scientifically valid or fully supportable.

*Response: The issue of non-point source pollution has already been addressed in previous responses to comments (see Wright-Pierce, HydroQual). Non-point sources of pollution are accounted for in all model runs. River and tributary flows are increased during times of high runoff, based upon the gaging information available in the watershed. The calibration and verification data sets were strategically chosen utilizing time periods with the lowest amount of runoff.*

*It is difficult to conclude whether or not runoff in the summer occurred for moderate or large storms by just observing total rainfall volumes as suggested by IP. Information on rainfall intensity and antecedent moisture conditions is also needed. The Livermore Falls NOAA weather station data presented by IP is actually evidence that little runoff existed during the calibration and verification data sets rather than evidence that runoff existed (as suggested by IP). From the many years of undertaking wet weather sampling, it is DEP's experience that summer runoff usually doesn't occur for storms of average intensity when the total precipitation volume is under 0.5 inches and only occurs occasionally for precipitation events with total rainfall volumes in the range of 0.5 to 1 inches. Hence the calibration data set contained very little runoff. The verification data set contained more runoff, but this is all accounted for in the model.*

*The North Jay rainfall data is unofficial. Assuming it is accurate, localized rainfall events within a large watershed such as the Androscoggin River usually do not affect the flow on the large river unless rainfall volume is great or rainfall intensity is high. Of the 18 storms cited at North Jay, only three had total volumes of precipitation of over one inch. None of these occurred in the calibration period.*

*Non-point source contributions of phosphorus were considered for the WASP model calibration / verification of the pond. The measured phosphorus at the pond inlet contains contributions from both point and non-point sources of pollution as do sample locations throughout the pond. The flow estimates at the pond inlet similarly included runoff events that occurred throughout the calibration and verification periods. Hence the phosphorus TMDL is supported by good data and analysis and is fully defensible. DEP is not opposed to additional analysis and or data collection by IP in the future as part of a phased TMDL.*

***The Draft TMDL improperly relies on WASP model to take address hydrodynamics of Gulf Island Pond.***

Gulf Island Pond is a dynamic environment that may respond dramatically to short term events. In preparing the draft TMDL, the DEP used the WASP model to simulate Pond conditions as if the flow of water through the Pond was a constant volume. To capture the effects of flow conditions it is appropriate to use a well calibrated hydrodynamic model to simulate the water movement, called the flow field, for use in the water quality model computations. At present, the flow field used for the Gulf Island Pond TMDL model has been assigned by the DEP modeler. It

was created through various transformation and averaging algorithms which are very poorly documented in the modeling report or in the TMDL.

The ability to accurately simulate nutrient transport through the Pond is as important as the water column kinetics in accurately simulating water quality. Implementation of appropriate hydrodynamic modeling can remove this degree of freedom in model calibration, i.e., error from the modeler's external specification of advective and dispersive transport. In addition, the use of a high resolution hydrodynamic model will provide the ability to properly assess effects of Pond flushing rates at various water levels, or for fill and draw operations for power generation.

WASP is not a hydrodynamic model. It is a computer code for simulating water quality for a specified flow field. Given the dynamic flow complexity of the pond, a flow field should be fashioned using appropriate hydrodynamic computational methods. The hydrodynamic model most suitable for Gulf Island Pond is CE-QUAL-W2. The CE-QUAL-W2 model was developed and is maintained through the Army Corps of Engineers, and has been successfully applied to hundreds of lake and river systems. The CE-QUAL-W2 model is well suited to Gulf Island Pond because of its established ability to compute the two-dimensional flow field for narrow systems that stratify.

The deficiencies and limitations of the WASP model were explained to DEP in public comments of July 2002. The DEP response was that "CE-QUAL-W2 would require a much more intensive data effort as input and would require additional data collection and time delays. Given the large additional time commitment and uncertain gains in accuracy of the model predictions of redoing the whole modeling effort, the DEP did not believe that abandonment of the current model was worthwhile." DEP maintained their indefensible position that abandonment of the WASP model was not "worthwhile" and has prepared the draft TMDL based on that antiquated model.

In summary, the impacts of the hydrodynamics of the Pond are not yet understood well enough to support reliable predictions of the point source phosphorus loadings to Gulf Island Pond. The Department acknowledges that additional study is required for development of the model's ortho-phosphorus uptake rate and other key parameters. Nonetheless, the Department has still set a target in the draft TMDL that poses a substantial burden on the point sources on the river and relied on an antiquated and inappropriate model for setting the target limits. It is critical that DEP better understand the cycling and assimilation of phosphorus in the pond. Rather than setting an overly conservative and scientifically unreliable phosphorus TMDL based on limited data, a robust model should be developed using an expanded data set that represents the critical conditions of concern before limitations are set.

*<u>Response</u>: This comment has been previously addressed in responses to NCASI comments. DEP does not believe this level of effort is needed in a phased TMDL that will rely more on data collection rather than modeling in the future. The pond volumes actually do remain constant. It is the flow that changes. These are accounted for in the WASP flow fields. Flushing rates and various water levels are already accurately portrayed in WASP.*

*It is true that DEP did state in the Response to Comments of the 2002 Modeling Report that it did not intend to pursue the use of a hydrodynamic model. DEP indicated then that the State of*

*Maine does not have the resources to undertake such a large effort. IP and the other paper mills did not pursue the use of a more complex model on their own in the intervening three years. The paper mills will have the time in the future to pursue this course of action if they so desire. In the interim, the TMDL has been based upon the best available information which is the WASP model, an EPA supported model for developing TMDL's.*

**DISSOLVED OXYGEN – BOD and TSS TMDLs for GULF ISLAND POND**

Unlike phosphorus, dissolved oxygen in Gulf Island Pond has been studied intensively for many years. Nevertheless, important scientific questions remain unanswered:

- How does sediment oxygen demand affect the DO profile observed in Gulf Island Pond?
- What are the decay rates for biochemical oxygen demand from sources upstream of the Pond and how are these decay rates addressed in mathematical models?
- How do the pond's complex hydrodynamics (vertical and horizontal transport and mixing) affect DO?
- How effective is the existing oxygen injection system and how may it be made more effective?
- How does hydropower generation affect dissolved oxygen levels in the pond?
- How do periodic high flows and other flushing events affect the dissolved oxygen profile in the pond?

As with phosphorus, important policy questions arise with potential for large societal impact. Careful consideration is due, especially to the thousands of people along the river whose livelihood depends on papermaking, as to what measures should be taken to raise oxygen concentrations in the deeper parts of the pond: e.g. oxygen injection, reduction or elimination of point sources, or a combination of the two. More fundamentally, is it appropriate to "protect" absent cold-water fish species that likely will not thrive in the warm water, regardless of its oxygen content? To put in another way, is the existing water quality standard for Gulf Island Pond appropriate? The draft TMDL glosses over or completely fails to address such policy considerations. The Department should clearly set out its position on these policy matters rather than leave it to speculation.

The following technical comments address the limitations of the water quality models relied upon by the Department in devising a control strategy for BOD and TSS discharges. This leads to perhaps that most significant policy question: should the Department recommend final target TMDLs for BOD and TSS based on suspect science, or should it set reasonable, intermediate, phased-in targets that provide opportunity for further study and decision-making based on real data. International Paper urges the Department to address the water quality issues with intermediate steps rather than arbitrarily set restrictive TMDLs for BOD and TSS without adequate justification.

*<u>Response</u>: These questions have been answered. There is a whole section on sediment oxygen demand in the 2002 modeling report including sensitivity analysis for SOD. The decay rates*

*upstream of the pond do not affect the TMDL to the pond expressed as a load to the pond. The pond's vertical and horizontal mixing have been addressed by the WASP model in the assignment of vertical and horizontal dispersion rates in the calibration and verification process. The effectiveness of the existing oxygenation system is addressed in the report from Wright-Pierce. The effect of hydropower generation was investigated and is discussed in the 2002 Modeling Report. Periodic high flows and flushing events result in a complete mix situation vertically within the pond. This too is discussed in the 2002 modeling report.*

*The Department has already stated its policy on the protection of Gulf Island Pond. At a recent Stakeholder meeting, Commissioner Gallagher stated that DEP is pursuing a course of action which results in full attainment of water quality standards at Gulf Island Pond with the current dam in-place. This includes the support of a cold water fishery. Cold water fish (brown trout) are actively being stocked in the river in Livermore Falls which is just above Gulf Island Pond. The Kennebec River in the Shawmut dam area currently supports and world class trout fishery and temperature there is not significantly different than Gulf Island Pond. Cold water fish could also thrive in Gulf Island Pond if adequate dissolved oxygen was present in the deeper pond areas with cooler water.*

***It remains uncertain as to what degree sediment oxygen demand affects the DO profile observed in Gulf Island Pond.***

Sediment oxygen demand (SOD) is a significant oxygen sink in the Gulf Island Pond model, as indicated by the Department's sensitivity analysis. The National Council for Air and Stream Improvement, Inc. (NCASI) has filed comments regarding the draft TMDL's discussion of SOD in the Pond. International Paper adopts and incorporates NCASI's comments as if fully set forth herein.

In summary the SOD analysis done to date by DEP is simply just not good enough to support a TMDL for TSS. Until DEP better understands the SOD process in Gulf Island Pond, restraint should be exercised in setting any TMDL for TSS. At the very least, modest, phased-in reductions in TSS loadings should be implemented while a more thorough understanding of the SOD dynamics is developed.

*<u>Response</u>: Previously addressed in responses to NCASI comments. The analysis for SOD is explained in the 2002 modeling report on pages 42 to 51 and involved several months of DEP staff time and dozens of model runs. DEP believes that the current analysis undertaken already illustrates a thorough understanding of SOD origins by pollutant parameter and source. The major source of current SOD is known to be from the effects of dying algae settling to the pond bottom. Point source contributions are known to be more significant in the middle portions of the pond. The model runs show that point source potential contributions from TSS could be considerably more than what occurs currently if point source TSS is not regulated to prevent additional increases in the future. Hence the TSS TMDL is appropriate.*

.***Uncertainty surrounds the decay rates for biochemical oxygen demand***

The assignment in the WASP model of different BOD decay rate constants to the Pond for different point source loads is not appropriate. DEP elected to increase the BOD decay rate constant as BOD discharges increased from the mills. As NCASI has pointed out, the proper practice in water quality modeling is not to adjust such parameters without a firm scientific basis. Moreover, in assigning different BOD decay rate constants to the Pond for different point source loads, the Department was not consistent with the fixed BOD decay rates it assigned to the river when it used QUAL2E.

Too many inaccurate and inconsistent assumptions have been made in setting the BOD TMDL. Before a final TMDL for BOD is issued, DEP should remodel the river system using consistent and scientifically defensible assumptions and more complete and representative data.

*Response: Previously addressed in responses to NCASI comments.*

***More study is needed on the effect of the pond's complex hydrodynamics (vertical and horizontal transport and mixing) on DO levels.***

If modeling will be used in subsequent stages of implementing the TMDL, International Paper believes that a more sophisticated, up-to-date approach will be necessary to reduce uncertainty in model predictions and to design cost-effective control strategies. The current generation of the model suffers from significant limitations, many of which we have already highlighted. NCASI also highlights these points in their comments.

Given the dramatic economic and societal implications of the results of the modeling conducted by DEP in setting the TMDLs, it is essential that DEP use the best tools available to assure appropriate representation of the water body and to determine the best solution to reaching water quality attainment. DEP has prepared the TMDL using an antiquated model. Whether or not DEP chooses to move forward with finalizing the draft TMDL, International Paper strongly urges the Department to recognize the limitations of the tools used to set the TMDL, and utilize better models during implementation.

*Response: Previously addressed in NCASI comments. The WASP model is adequate to set a TMDL. MDEP has recently made many upgrades to the WASP model through EPA supported contracts and oversight. Hence the model is not antiquated. As stated previously there is no assurance that another model such as the one cited would perform any better than WASP. In either case there is a lot of uncertainty associated with a modeling analysis involving complex environmental conditions such as what is experienced within Gulf Island Pond.*

***Further analysis is needed on the effectiveness of the existing oxygen injection system and how may it be made more effective.***

An additional concern about the vertical transport parameters and the characterization of total transport in the Pond relates to the use of the model as a tool for the design and operation of the oxygen injection system. The large degree of uncertainty in the characterization of transport in the Pond is a significant limitation when evaluating the mitigating effects of oxygen injection,

especially in the lower reaches of the pond. The model's current characterization of transport is not adequate for this use.

Again, as with phosphorus, International Paper advocates less reliance on simplistic models as the DEP adopts a phased approach to implementation of the TMDL for BOD and TSS, along with continued development and scrutiny of data. As the National Research Council, in its 2001 review of the TMDL program stated:

> Many debates in the TMDL community have centered on the use of "phased" and "iterative" TMDLs. Because these terms have particular meanings, this report uses a more general term—adaptive implementation. Adaptive implementation is, in fact, the application of the scientific method to decision-making. It is a process of taking actions of limited scope commensurate with available data and information to continuously improve our understanding of a problem and its solutions, while at the same time making progress toward attaining a water quality standard. Plans for future regulatory rules and public spending should be tentative commitments subject to revision as we learn how the system responds to actions taken early on."

International Paper intends to bear a share of the burden for further scientific inquiry and to remain actively involved in the TMDL process as it proceeds.

*Response: DEP supports additional data collection and data analysis in a phased TMDL approach. The majority of the burden for this would have to fall upon the mills and FPLE.*

## LIVERMORE FALLS IMPOUNDMENT TMDL FOR TSS

The draft TMDL for TSS in the Livermore Falls Impoundment is based on a *draft* listing of impaired rivers and streams in Maine known as the 2004 Integrated Water Quality Report. (See page 54 of Appendix II.) The cause for the listing is given in the draft report as "aquatic life criteria." The "monitored date" (presumably for non-compliance) is given as 2002. It is premature to list the Livermore Falls Impoundment as impaired, based on the macro-invertebrate sampling that has been conducted thus far by the Department. International Paper has previously set forth its position in correspondence to DEP. (See attached June 2, 2004 letter to Dana Murch from Tom Saviello) International Paper reiterates its opposition to an impairment designation of the Impoundment. The same 2002 data being used by DEP to deem the Impoundment as impaired was described in the draft TMDL as an "anomaly" and DEP, in fact, recommended further sampling and analysis. Then, puzzlingly and arbitrarily, DEP selected the average loading of two years, 1995 and 2000, as the maximum load. The 1995 data is quite dated, and both years' data precede promulgation of Chapter 579 of Maine's rules, which occurred in 2003, and therefore cannot be used by the Department as the basis for deeming the Impoundment as impaired. As our June 2, 2004 letter stated, International Paper objects to the Department's retroactive use of the earlier data as prohibited by law. As such, based on 2003 and 2004 data, the Livermore Falls Impoundment is not impaired and hence a TSS TMDL for that section of the river is not warranted.

*<u>Response</u>: The TMDL report indicates that an additional data set at low flow conditions similar to 2002 are needed to determine whether or not the 2002 data are an anomaly. In the interim, DEP still considers the 2002 data as demonstrating non-attainment and hence did use that data to list the Livermore Falls impoundment as non-attainment. The 2003 and 2004 data are not reliable to make a call on attainment of aquatic life criteria at low flow conditions, due to the fact that those were wet summers.*

*In a letter dated June 24, 2004, DEP responded to International Paper's letter of June 2, 2004. In this letter the Department summarizes its position that the 2002 data collected on the Livermore Falls impoundment indicate non-attainment of class C aquatic life criteria. In addition, the Department stated its position that DEP's chapter 579 biocriteria regulations apply to an updated version of the model (2000) used to evaluate aquatic life criteria. The data collected before January 1, 2000 are subject to the older version of the model, but can still be used for determinations of aquatic life criteria compliance. The 1995 data show that non-compliance of aquatic life criteria is expected during river TSS loading conditions exceeding 40,000 ppd. This is useful information considering that International Paper has not made any significant improvement to their treatment system to address their high levels of TSS loading.*

*The 1995 and 2000 data are not arbitrary selection of the data. The 2000 data represent the highest TSS loading conditions for which attainment of aquatic life criteria occurred. The 1995 data represent loading conditions of TSS for which a high degree of certainty occurs for a non-attainment status. The Androscoggin River did not meet class C criteria in three locations below International's Paper that summer and there are no contradictory findings to suggest that TSS loadings that high are acceptable. The phased implementation will determine whether or not lower loading conditions that could possibly result in TMDL allocations that are 50% or more lower than the current proposal are appropriate.*

**<u>MARGIN OF SAFETY IS UNDEFINED AND OVERLY CONSERVATIVE.</u>**

The margin of safety resulting from numerous assumptions made by DEP in the modeling process is overly conservative. NCASI has raised a number of questions concerning the application of such a large margin of safety, including using the highest predicted chlorophyll-*a* concentration for Gulf Island Pond as the basis for the phosphorus TMDL; setting a higher CBOD decay rate (0.04 per day); and assuming that point sources discharge their maximum allocated waste load simultaneously during a 10-year low flow events.

To estimate the magnitude of the MOS, International Paper had predictive modeling conducted using less conservative circumstances than DEP's. The model inputs were altered by lowering the temperature of the river by 1ºC, increasing the river's flow rate approximately ten percent, maintaining the CBODu loadings at the current licensed weekly averaged loadings of the paper mills, and assuming the point source phosphorous discharges were equivalent to the averages from the summer 2004 as presented in the TMDL, Figure 18. For consistency with DEP's model, a second oxygen diffuser was left in the model. The results of this model run are striking: more CBODu enters Gulf Island Pond, presumably because the cooler temperature alter removal in the riverine segments; dissolved oxygen levels are at attainment in the pond; and the pond-average chlorophyll-*a* concentration is at the 10 ppb threshold targeted by the DEP.

International Paper urges DEP to include a similar analysis in the final TMDL. By only slightly reducing the MOS, the TMDL may be made significantly more realistic. Given the stakes, DEP needs to be more forthcoming and reasonable regarding the MOS.

*Response: This was previously addressed in the NCASI comments. IP's model run at 10% higher flow and 1 $^{o}$C lower temperature are arbitrary assignments that would not be protective enough of the river. State law requires the use of 7Q10 flow, not 10% higher than 7Q10 flow. MDEP's assignment of temperature was based upon the careful evaluation of many years worth of data from the continuous monitor. The average of the weekly maximum temperatures for each summer was used as the design temperature. IP choice of temperature, in contrast, is arbitrary. In the final report, the MOS was changed to an explicit MOS equal to 10% of the total TMDL.*

## SAMPLE ALLOCATIONS

The inclusion of sample allocations in the draft TMDL is premature and unnecessary. The very act of publishing them gives them unsubstantiated legitimacy, may set unreasonable expectations, and is arguably inconsistent with the Department's stated commitment to adopt a phased approach to implementation of the TMDL. Rather than identify specific point sources and sample reductions, DEP should create a hypothetical scenario to establish the process and illustrate the procedures to implement the TMDL. International Paper objects to the inclusion of the sample allocations and urges DEP to remove the sample allocations from the final TMDL.

*Response: This has previously been addressed in responses to NRCM comments.*

## CONCLUSION

International Paper participates in the National Council for Air and Stream Improvement, Inc. (NCASI). At the request of International Paper and other paper mills on the Androscoggin River, NCASI has submitted separate comments on the draft TMDL. Comments submitted by NCASI are hereby incorporated by reference. In addition, the Gulf Island Pond Oxygenation Partnership, of which International Paper is member, has over the course of several years provided numerous documents and comments to DEP on the development of the draft TMDL. Those prior submittals and those submitted independently by International Paper are incorporated into these comments as if fully set forth herein.

Although DEP has clearly put significant effort into preparing the draft TMDL, it still falls short. This matter is complex and involves high stakes. International Paper encourages DEP to refocus its efforts, with stakeholders, to revise and redraft the TMDL based on a realistic margin of safety that is not unduly burdensome to a select few entities on the river and which also achieves the protections necessary for reaching attainment. To this end, International Paper encourages DEP to fully consider the above comments and fully commit to assuring the development of a practical and attainable TMDL. To discuss these comments further or answer any questions that you may have, please contact me at (901) 419-7141.

## FPL Energy

FPL Energy Maine Hydro, LLC (FPLE) would like to thank the Maine Department of Environmental Protection (MDEP or Department) for its efforts in drafting the Androscoggin River Total Maximum Daily Load (TMDL). The preparation of this draft TMDL represents a major effort by the staff of MDEP, and FPLE appreciates that effort.

These comments are made in reference to the draft TMDL only.

FPLE takes exception to the implications in this draft TMDL that the Gulf Island Dam may somehow be responsible for mitigating any adverse effects to the water quality of Gulf Island Pond that result from the pollutant discharges into the Androscoggin River. FPLE also would like to note that for the past several years, the MDEP has been engaged in a stakeholder process to better define the extent of algae blooms in the pond. Throughout this process, it has been understood by all parties that the mitigation for algae blooms that result from phosphorus discharges would be the responsibility of the dischargers to the pond. As such, FPLE has not been engaged in a meaningful way on this issue and reserves its rights to seek further clarification on the conclusions drawn in this draft TMDL to the extent such implications are carried forward in the final TMDL.

Furthermore, FPLE reserves its rights to revise, expand, or otherwise amend these comments,particularly if the TMDL is used in whole or in part as a basis for issuance, if applicable, of any §401 Water Quality Certificate for the Gulf Island Dam.

We respectfully submit the following comments on the draft TMDL:

*<u>Response</u>: Comments to the draft TMDL from many of the other stakeholders have indicated that FPLE should be held accountable for a portion of the responsibility of the TMDL due to the reduction in the Androscoggin River's assimilative capacity that results from Gulf Island dam. DEP concurs with the concept of holding the dam owner partly responsible. The presence of the dam clearly affects assimilative capacity available in Gulf Island Pond as evidenced by the model's prediction of non-attainment of DO criteria in some of the pond areas at zero discharge of point sources, and the TMDL needs to account for this fact.*

**<u>The draft Androscoggin River TMDL is inconsistent with Section 303(d) of the Federal Water Pollution Control Act and is not approvable by EPA on its face.</u>**

***1. The Gulf Island Dam does not "load" the Androscoggin River***

According to EPA guidance documents, a TMDL is *"…a tool for implementing State water quality standards and is based on the relationship between pollution sources and in-stream water quality conditions..."*[1] EPA goes on to further state that the *"...objective of a TMDL is toallocate allowable loads among different pollutant sources so that the appropriate control action can be taken and water quality standards achieved...."*[2]

TMDLs are to be developed by states where existing point and non-point source regulation is inadequate to attain or maintain compliance with state water quality standards after the application of technology and other required controls. A TMDL must first determine the Loading

Capacity (LC) of the receiving water (i.e. the Androscoggin River and/or Gulf Island Pond) based on its hydrologic and geomorphic characteristics. Once the Loading Capacity is determined, the TMDL must specify pollutant load allocations among such sources, with Waste Load Allocations (WLA) apportioned among all point sources, and Load Allocations (LA) apportioned among all non-point and natural sources.

In EPA's view, *"the TMDL process is intended to protect all waters from excessive pollutant loading…."*[3] The definition of "load" is found in 40 CFR §130.2(e):

> *"(e) Load or loading. An amount of matter or thermal energy that is introduced intoa receiving water; to introduce matter or thermal energy into a receiving water. Loading may be either man-caused (pollutant loading) or natural (natural background loading)."*

Thus, by definition, the TMDL is required to allocate among the above sources all "matter or thermal energy that is introduced into a receiving water…."

The TMDL identifies pollutants of concern for the Androscoggin River as carbonaceous biochemical oxygen demand (CBOD), ortho-phosphorus (ortho-P), total phosphorus (total-P),and total suspended solids (TSS).[4]

The state water quality criteria directly or indirectly impacted by the introduction of these pollutants are dissolved oxygen (DO) and the designated use of water contact recreation.[5]

Excessive amounts of phosphorus cause algae blooms, which, in turn, contribute to violation of both of these criteria in Gulf Island Pond.[6] TSS and algae contribute to sediment oxygen demand (SOD), a "major source" of oxygen depletion in Gulf Island Pond.[7] CBOD also creates a source of oxygen depletion in Gulf Island Pond.[8] MDEP states that "historic sources of pollution" are also responsible for SOD.[9]

Bullet eight of the "TMDL Summary – Submittal Template" states that the Gulf Island Dam contributes to non-attainment of DO criteria *"by creating an environment of low water movement and low vertical mixing within the water column."* Consideration of such a condition, regardless of its accuracy or inaccuracy, is inappropriate in a TMDL, as the condition is not descriptive of loading of "an amount of matter" or "thermal energy" into a receiving water. In short, such a condition is not a "load." Rather, it is simply a description of the hydrologic and geomorphic characteristic of the receiving water that is to be the starting point for the TMDL analysis.

Since the Gulf Island Dam is not alleged by MDEP to be loading the Androscoggin River above the dam, FPLE objects to any statement or implication found within the TMDL that the Gulf Island Dam should bear, directly or indirectly, any allocation of responsibility for non-attainment of any water quality criterion in a TMDL.

Any TMDL that does not apportion all WLA & LA solely among the point and non-point sources discharging above the dam is unlawfully creating an arbitrary, capricious, unfair, and incomplete allocation and should not be approved.

*<u>Response</u>: Model predictions indicate that there are no allowable pollutant loads that will result in full attainment of DO criteria without some amount of oxygen load being injected. The*

*amount of oxygen injection needed is specified as a load which fits into the legal definition of a TMDL.*

***2. Non-point sources of loading are neither accurately quantified nor receive a fair allocation in implementing the TMDL.***

The TMDL clearly identifies non-point source (NPS) pollution as a contributing element to thecurrent water quality measured in Gulf Island Pond:

*"Sources of non-point source pollution include land use activities related primarily to residential development, silviculture, and agriculture."*[10]

According to the MDEP's modeling report that was used to support the TMDL, non-point sources represent 64% of the TSS, 15% of the CBOD and 10% of the total phosphorus entering Gulf Island Pond.[11] In addition, three first order tributaries discharging to the Androscoggin River above the dam (Sunday River, Chapman Brook and the Nezinscot River) are identified as priority non-point source watersheds and listed on Maine's NPS Priority Watershed List.[12] Despite this significant contribution, the MDEP fails to investigate, much less implement, NPS reductions. Rather, MDEP simply states that *"there are limited opportunities for the control of significant amounts of non-point source pollution given the relatively undeveloped nature of the watershed."*[13]

The TMDL goes on to state that *"non-attainment of class C DO criteria in deeper portions of the pond is predicted by the water quality model even if point source discharges are eliminated due to the sediment oxygen demand from natural and nonpoint sources of pollution."*[14] Apparently, the MDEP assumes that the responsibility for the legacy SOD loading from historical pollution sources, and the continued loading from non-point and natural sources, somehow is the responsibility of the dam. This presumption is not an appropriate allocation of load responsibility as noted above. It is also contrary to EPA guidance on TMDLs which states:

*"In order to allocate loads among both nonpoint sources and point sources, there must be reasonable assurances that nonpoint reduction will in fact be achieved. Where there are not reasonable assurances, under the CWA, the entire load reduction must be assigned to point sources."*[15]

With the MDEP's failure to explore non-point source mitigation efforts, the TMDL arbitrarily and unfairly places responsibility for mitigating the impacts of these pollution sources squarely on the backs of the others, and again creates an inappropriate WLA & LA calculation required to lawfully complete the TMDL.

*<u>Response</u>: The issue of non-point source phosphorus pollution has been previously discussed under responses to IP and HydroQual's comments and should be referred to for more detail. The reduction of non-point sources in the priority tributary watersheds are an important consideration for water quality within those tributary watersheds but not as important for Gulf Island Pond. Non point source pollution affects water bodies the most that are first encountered such as the smaller tributary streams. Larger rivers such as the Androscoggin are affected less due to higher dilution and the fact that a large portion of the pollution loads have been assimilated within the smaller tributaries. It is within the smaller tributaries where most of the*

*impact from non-point source pollution is realized due to the lower dilution that they receive here, than what would occur on the Androscoggin River. There is not enough residence time within Gulf Island Pond to support algae blooms during times of high runoff. The TSS is similarly not an issue during times of high runoff, since the Livermore Falls impoundment is flushed of bottom sediments. The base flow loads assumed for the model represent primarily natural sources and there is little that can be done to lower this loading. The issue with water quality is during times of low flow when point source loading is the primary impact. Model runs at zero discharge of point source are made with sediment oxygen demand reduced so that legacy pollution is not included. The SOD inputs used for the TMDL, and zero discharge are summarized in Table1 of the TMDL report. More detailed explanations of the origins of the SOD inputs can be obtained in the 2002 modeling report (pages 42-51).*

**Specific Comments to the Draft TMDL:**

Without waiving the foregoing challenge to the legality or approvability of the TMDL, FPLE submits the following specific comments to the TMDL:

*1. Page 1, TMDL Summary. Eighth bullet*. The model run referenced in this bullet that indicates continued DO non-attainment in the event that point sources are eliminated is predicated on the discontinuance of the existing oxygenation diffuser. However, other MDEP model runs indicate that if the point source discharges are eliminated and the existing oxygen diffuser system continues to run, Gulf Island Pond will meet the DO criteria for Class C waters.[16] This fact should not be overlooked and should be clearly stated in this section and elsewhere in the TMDL where such model runs are discussed.

It is also important to note that modeling runs indicate that the pond will not experience algae blooms if point source discharges are reduced, regardless as to whether the existing diffuser remains in operation or not.

*Response: Agree with the conclusions. The reader can refer to the 2002 Modeling Report to obtain this information. This report and the 2004 Data Report are also referenced s a part of the TMDL. It should be obvious to most readers of the report that the oxygen diffuser addresses dissolved oxygen levels in the pond, not algae blooms.*

*2. Page 2, TMDL Summary. First bullet*. MDEP presents little to no supporting data for establishing 10 ppb as the threshold for algae blooms in the TMDL. In fact, MDEP quite clearly states on Page 5 of the TMDL - *"There does not appear to be a good relationship between algae blooms and chlorophyll-a at any given location."* However, the report goes on to suggest thatusing pond averaged chlorophyll-a, *"a good relationship is apparent in the chlorophyll-a data and observed blooms."*

This latter conclusion is based on the observation of a pond average chlorophyll-a value of 10 ppb occurring simultaneously with a bloom on August 4. This *single observation* of paired bloom-chlorophyll-a data is not, in our opinion, sufficient data upon which a significant TMDL is determined. The report acknowledges the need for additional data to better link phosphorus

and chlorophyll-a levels to algae blooms. It is clearly premature to use a value of 10 ppb to establish a definitive phosphorus TMDL for this system.

*Response: This has previously been addressed in Fraser Paper's comments.*

*3. Page 2, TMDL Summary. Table titled "TMDL for Gulf Island Pond in PPD."* This table identifies the assimilative capacity of the pond for the various pollutants shown and the corresponding Load Allocations and Waste Load Allocations assuming additional oxygen is injected into the pond. What is the assimilative capacity of the pond without oxygen injection? What is the assimilative capacity of the pond with the existing oxygen injection?

*Response: The remaining assimilative capacity within Gulf Island Pond is predicted to be zero in both cases.*

*4. Page 3, TMDL Summary. Margin of Safety.* MDEP's approach of using "implicit margins of safety generated by a range of assumptions" requires, per EPA guidance17, that the conservative assumptions reflect "uncertainty about the relationship between the pollutant loads and the quality of the receiving waterbody" and be "approved by EPA".

Please provide a listing and description of all MOS' used in the TMDL and provide documentation of EPA's approval of these MOS'.

For purposes of defining DO levels relative to the minimum standard of 5 ppm, it is our understanding that the MDEP adjusts model input parameters downward such that the output of the model is 0.4 ppm lower than it otherwise would be without the MDEP adjustment. Is this true? If so, what is the basis for such reductions?
What is the cumulative MOS used in this analysis?

*Response: The final TMDL uses an explicit MOS of 10%. All MOS are listed in the TMDL submittal template. EPA's approval letter will document approval of the MOS and TMDL. The issue of the diurnal DO adjustment in subsurface segments has been previously addressed in NCASI comments. The diurnal adjustment of 0.4 ppm for dissolved oxygen in subsurface model segments is made to convert the model results which are an average over several days to a daily minimum. The class C DO criteria of 5 ppm and 60% of saturation are a daily minimum. This is not a MOS. The continuous DO data at Gulf Island dam were used to obtain the value for the adjustment.*

*5. Page 4, TMDL Summary.* Monitoring Plan for Phased TMDL. We support the recommendation of a phased implementation approach for the TMDL.

*Response: Agree.*

*6. Page 4, TMDL Summary. Implementation Plan.* As stated above, a TMDL must be drawn up to match the loading of only point and non-point sources with allocations tied solely to those loads. Statements which claim that Gulf Island Dam "accounts for" any issue, when the dam is not included in any WLA or LA, is inappropriate for the TMDL process. By doing so, MDEP is

unlawfully attempting to allocate responsibility for the introduction of matter or thermal energy into a receiving water towards an entity that is responsible for neither.

The first bullet of this section states that 60,000 ppd of oxygen is required to be injected from a new site at the Lower Narrows to comply with Class C DO criteria with all point source discharges removed. This section should also state that Class C DO criteria can be met in all areas of the pond if point sources are removed and the existing diffuser at Upper Narrows continues to operate. This section should also cite the amount of oxygen that needs to be injected from the existing site at the Upper Narrows in order to meet Class C DO criteria if all point sources are removed.

The TMDL should also indicate the amount of oxygen that would need to be injected from either site to meet Class C DO criteria if all point and non-point sources are removed. Finally, the TMDL should state how much oxygen would need to be injected from either site if all point, non-point, and natural sources are removed?

This second bullet of this section states that modeling indicates that the presence of the dam accounts for about 30% of the algae levels in Gulf Island Pond with the TMDL implemented. Notwithstanding our strenuous objection to this conclusion, please provide a copy of this model run.

How is the 30% figure derived? Why is the figure based a percentage after the TMDL is implemented as opposed to before the TMDL is implemented? Does the MDEP presume that the dam is responsible for mitigating all non-point and natural source impacts after point sources have been eliminated?

Finally, the TMDL should clearly state that modeling runs indicate that the pond will not experience algae blooms if phosphorus discharges are reduced, regardless as to whether the existing diffuser remains in operation or not.

*<u>Response</u>: Many of these questions are not needed to complete the TMDL which specify the allowable pollutant loads and required oxygen loads to meet water quality standards. Additional model runs at zero discharge of point sources will be added to the final report that includes information on the amount of oxygen injection needed at Upper Narrows to meet DO criteria. There is not enough information available to generate model runs without NPS and natural pollutant inputs. DEP does not believe this is useful information, due to the fact that it is not possible to eliminate all non-point and natural loads nor is there significant opportunity to treat NPS loads that would impact water quality standards in Gulf Island Pond.*

*The 30% responsibility figure (revised to 20%) is derived from Figure 9a of the modeling report. The model run at zero discharge of point sources assumes phosphorus inputs similar to natural conditions. The chlorophyll-a is increased from 2.5 to 4.5 ppb under this condition due to the presence of the dam. The 2 ppb chlorophyll-a attributable to the dam is 20% of the level of chlorophyll-a predicted by the model (10 ppb) at the TMDL loading. An attainment baseline condition rather than a non-attainment baseline condition should be made for the comparison. This does assume that the dam is responsible for mitigating natural pollutant loads. DEP*

*concurs with the statement that the pond will not experience algae blooms if phosphorus discharges are reduced. However the dam influences how much the phosphorus discharges need to be reduced. Much greater reductions are needed with the dam in-place.*

*7. TMDL Page 1. Fourth Paragraph.* MDEP states that the "*low dilution that is available for point source discharges and the poor capacity provided by the pond to assimilate wastes both result in a difficult situation for maintaining water quality."* Given that the purpose of theTMDL is to address load into the receiving waters by point and non-point sources, and given theapparent sizeable impact of non-point sources, why does the MDEP ignore BMPs designed to reduce or eliminate the introduction of non-point source pollutants into receiving waters? Also, please provide supporting documentation for the 8.6:1 dilution ratio referenced in this section.

*Response: The issue of non-point sources has been previously addressed. The total licensed flow of all point sources is 196 cfs. The 7Q10 flow at Livermore Falls, the location of the most downstream point source is 1680 cfs. The ratio of these two flows is 8.6.*

*8. TMDL Page 3. Fourth Paragraph. Fifth and seventh bullet.* Reference is made once again to the morphology of the river as a *"primary cause of algae blooms."* As we have stated previously, WLA and LA are the only load factors which may be used to calculate the TMDL. In addition, modeling indicates that the blooms will not persist with point source reductions. Finally, the MDEP should point out that with no point source discharges, the pond will meet DO standards if the existing oxygenation plant continues to run.

*Response: Previously addressed in responses to FPLE comments.*

*9. TMDL Page 5. First bullet.* We object to the manner that MDEP presents this data. Based on prior discussions with MDEP Paul Mitnik, data from the continuous monitoring data collection effort for Gulf Island Pond is not included in this TMDL. We believe the continuous monitoring data is the only meaningful source of data that can justify statements regarding the ability of the pond to meet monthly average requirements. We believe the MDEP should utilize all data available to it when characterizing the actual water quality conditions of the pond.

*Response: Agree. All data should be used as indicated in the final data report. Suggest FPLE refer to the final data report which uses all sources of information from 2004 to suggest that the DO non-attainment experienced in Gulf Island Pond is a frequent summer occurrence. The continuous monitor data was also used for other evaluations such as the diurnal DO adjustment in model subsurface segments of Gulf Island Pond. The calibration of the model discussed in the 2002 Modeling Report also was calibrated to the continuous DO data at Turner and Gulf Island dam.*

*10. TMDL Page 5. Last Paragraph.* The TMDL concludes *"There does not appear to be a good relationship between algae blooms and chlorophyll-a at any given location."* However, the report goes on to suggest that using pond averaged chlorophyll-a, *"a good relationship is apparent in the chlorophyll-a data and observed blooms."* This conclusion is based on the

observation of a pond average chlorophyll-a value of 10 ppb occurring simultaneously with a bloom on August 4, 2004. This *single observation* of paired bloom-chlorophyll-a data is not, in our opinion, sufficient data upon which a significant TMDL is determined. The report acknowledges the need for additional data to better link phosphorus and chlorophyll-a levels to algae blooms. It is clearly premature to use a value of 10 ppb to establish a definitive phosphorus TMDL for this system.

*Response: This has been previously addressed in Fraser Paper comments*.

*11. TMDL Page 10. First Paragraph.* The modeling estimate used in the TMDL for total and ortho-P assimilation between point source discharges and the entrance to Gulf Island Pond at Twin Bridges uses rates that differ by more than two orders of magnitude, which the TMDL report attributes to differences in water depth and the free-flowing nature of the river at these locations. While some differences may exist, estimated travel time (Maine DEP 2002) for river segments from Rumford to Jay and from Jay to the Nezinscot River are also relatively similar (similar mean depths and mean and 7Q10 flows and velocities). This conflicting scenario supports the conclusion that phosphorus sources and dynamics in the river are not yet understood well enough to support reliable predictions of the point source phosphorus loadings to Gulf Island Pond. There may be a higher proportion of agricultural land adjacent to the Androscoggin River in the river reach between Jay and Gulf Island Pond compared to the reach between Rumford and Jay. There may also be other sources of ortho-P such as agricultural runoff, river sediments, or wetlands between Jay and Gulf Island Pond which could explain the apparent lack of ortho-P assimilation in this river reach.

The wet, cool conditions of the summer, as pointed out in the TMDL report, are not representative of the low flow, warm summer temperature conditions being modeled. We agree with Maine DEP that using data generated during the wetter, cooler period (2004 data) to predict phosphorus utilization during low flow summer conditions when river water travel times and temperatures are higher is problematic. We recommend that further model predictions for low flow conditions should be corroborated with additional field data from a period that is more representative of low flow summer conditions, and addressed as such in the adaptive management program.

*Response: This is addressed in IP comments. Further efforts by MDEP will be focused on data collection rather than modeling. There will be opportunities for stakeholders to undertake any additional data collection and modeling that they so desire.*

*12. TMDL Page 13. Second paragraph.* As noted in a previous comment, MDEP should describe all of its conservative assumptions used in arriving at its MOS.

*Response: All MOS will be listed in the final report. The final margin of safety is an explicit MOS of 10% and all conservative assumptions have been eliminated.*

*13. TMDL Page 20. Last paragraph.* We object to MDEP once again assigning load

responsibility to anything other than point or non-point sources. MDEP has presented no evidence that the Gulf Island Dam contributes in any way to any of the pollutant load identified by this TMDL.

Please explain the difference between the chl-a prediction of 5.3 ppb outlined in this paragraph versus the 2.4 ppb level predicted in model run 0B from the June 2002 Modeling Report. What modeling parameters were changed to produce the dramatically different result?

*Response: As explained earlier in the report (pp 7 – 14), the algal component of the model was re-calibrated based upon the 2004 data, and re-verified with the 2000 and 1998 data.*

*14. TMDL Page 22. Third paragraph.* We again strenuously object to MDEP attempts to address anything other than sources of load in the TMDL implementation. MDEP has presented no evidence that the Gulf Island Dam is a load source to the Gulf Island Pond, and any inclusion of the dam in any TMDL implementation is an arbitrary, capricious, unfair, and improper allocation of responsibility for loading into a receiving water.

*Response: Addressed previously in responses to FPLE comments.*

*15. TMDL Page 24. Figure 10.* We note that the analysis of contributors to the Total Phosphorus Loads at Gulf Island Pond indicates that non-point sources contributed *25%* of the total phosphorus load in 2004. This is a significant percentage of the overall pollutant load. As we stated earlier, we believe that MDEP should include specific mitigation measures such as BMPs for the TMDL that address the non-point pollution load source.

*Response: NPS issue addressed previously in responses to FPLE comments. It should also be noted that NPS is only 0.5 % of the total ortho-P load which is the most available form of phosphorus for algae growth. DEP agrees with the recommendation from HydroQual to focus effort of P-reduction on ortho-P, rather than total-P.*

*16. TMDL Page 26. Last paragraph.* As stated above, a TMDL must be drawn up to match the loading of only point and non-point sources with allocations tied solely to those loads. Statements which claim that Gulf Island Dam "accounts for" or is "responsible for" any issue, when the dam is not included in any WLA or LA, is arbitrary, capricious, unfair, and inappropriate for the TMDL process. By doing so, MDEP is unlawfully attempting to allocate responsibility for the introduction of matter or thermal energy into a receiving water towards an entity that is responsible for neither.

*Response: Addressed previously in responses to FPLE comments*

*17. TMDL Page 27. Last paragraph.* We assume that the diurnal DO adjustment calculated for the TMDL has been done without using the continuous monitoring data collected in Gulf Island Pond. As stated above, we ask that MDEP use this data to document the observed trends and comparisons in water quality because the data provides a much more comprehensive data set from which to analyze trends. FPLE believes that a data set of roughly 17,000 data points from the continuous monitoring system provides a significantly more comprehensive assessment of

actual conditions in Gulf Island Pond than the 26 data points from the Acheron study that is listed as the data source for DO levels in the TMDL.

*Response: This paragraph refers to diurnal DO adjustments made to model segments of the Androscoggin River (Berlin to Twin Bridges), not Gulf Island Pond. A data set of 17,000 data points on Gulf Island Pond is not useful for estimating diurnal trends on the river. River depth and levels of bottom attached algae are important considerations that affect diurnal DO trends. The pond and river have very different depths and there is no bottom attached algae on the pond. The river data are a better source of information than the pond data for estimating diurnal DO trends on the river. On Gulf Island Pond, the continuous monitor data were used to derive diurnal DO adjustments as is explained in the 2002 modeling report (text, pages 52-53; Figure 26, page 60).*

*18. TMDL Page 42. First paragraph.* Additional monitoring is recommended for the TMDL. The TMDL is unclear on whether the monitoring will be a continuation of the existing continuous monitoring program or a new TMDL monitoring program. We presume it is the former. Please clarify.

*Response: There will be a new monitoring program established as part of the phased TMDL implementation that will be expanded significantly from the current continuous monitors. The current continuous monitors will likely be continued with some possible changes in depth of monitoring.*

*19. TMDL Figures 12-21.* Why has the MDEP chosen to refer to a DO compliance depth rather than listing the volume of non-attainment and maximum chl-a levels as has been done throughout this stakeholder process?

The use of a DO compliance depth is misleading in that it implies that non-attainment occurs at or below that depth throughout all segments of the pond. We suggest that the non-attainment volume and maximum chl-a levels be listed on each schematic to be consistent with the June 2002 Modeling Report. To the extent the MDEP wants to refer to a DO compliance depth, we recommend that it reference both the minimum depth where non-attainment occurs and the maximum depth where attainment occurs. For instance, on Figure 12, the minimum depth where non-attainment occurs is at 10 feet and the maximum depth where attainment occurs is at approximately 25 feet.

*Response: All of the chlorophyll-a levels for Figures 12-21 can be obtained from Figure 9A. The volume of non-attainment of DO criteria as a percentage was dropped due to the difficulty in expressing this information with no information about DO in the side embayments of Gulf Island Pond. The information (compliance depth at various locations) can be obtained directly from the schematic plots. Language will be added to the final report explaining the compliance depth occurs "at some locations."*

*20. Additional/Updated Model Runs.* In addition to the clarifications on the runs noted above, we request that model runs 0A, 0B, 2A and 2B from the June 2002 Modeling Report be updated with changes from modeling inputs and included in the TMDL. This will provide a more

complete description of impacts resulting from the recommendations of the TMDL and put everything on an "apples to apples" footing. Again, we ask that the schematics include the percent of non-attainment and the maximum chl-a for each run.

*Response: This information is not needed to specify a TMDL for Gulf Island Pond and does not need to be included in the report. Updated information and schematics for model runs 0A and 0B of the 2002 modeling report will be provided in the TMDL report. DEP does not see any value to updating model runs 2A and 2B of the 2002 report which are run at inputs of the paper mill 95 % confidence intervals of reported discharge levels from 1998 to 2000. The TMDL inputs currently being used are different than this.*

## Conservation Law Foundation

Letter of February 17, 2005
Steve Hinchman, Staff Attorney

CLF is pleased to comment on Maine Department of Environmental Protection's draft TMDL for Gulf Island Pond. CLF is a nonprofit, member-supported organization with offices in Maine, Massachusetts, New Hampshire, Rhode Island and Vermont. CLF has advocated for New England's environment since 1966, working to protect the region's people, natural resources and communities. We have long worked to protect water quality throughout New England by helping states design and implement strong TMDLs designed to bring our region's waters into compliance with water quality standards.

While we complement Maine DEP on its research and monitoring of poor water quality in Gulf Island Pond, we have several concerns regarding the draft TMDL. As an initial matter, a TMDL must set specific waste load allocations that will result in attainment of state Water Quality Standards (WQS), plus a margin of safety. 33 U.S.C. § 1313(d)(1)(C). It is unclear why DEP has only proposed "sample waste load allocations." DEP may not defer to later negotiations with the dischargers to determine allocations. DEP has already delayed far too long from its statutory mandate to enforce WQS on the Androscoggin – this poor tactic will only lead to further delay in cleaning up the river. DEP must set license limits and needs to move forward immediately.

*Response: The issue of specific waste load allocations has been addressed in the responses to Maine Rivers comments.*

Dissolved Oxygen WQS

Regarding the TMDL limits for BOD-5, the draft applies an illegal and inadequate standard for dissolved oxygen (DO) which would not result in attainment of state WQS and would therefore not meet the requirements of the Clean Water Act. As you know, last year, the Maine legislature enacted revisions to Class C WQS for dissolved oxygen that would have set a monthly average DO criterion of 6.5 ppm at 22° Celsius. DEP, however, withdrew those proposed revisions from EPA review due to an error in the statute. Under the Alaska Rule, modifications to state WQS are legally ineffective unless approved by EPA. See, e.g., 40 C.F.R. § 131.21(c). Thus, the draft TMDL must be revised using the prior narrative standard. See 38 M.R.S.A. § 465(4)(2004) (require that Class C waters "be of such quality that they are suitable

for the designated uses of . . . fishing . . . recreation in and on the water . . . and as habitat for fish and other aquatic life").

Historically, DEP has applied a monthly average DO criterion of 6.5 ppm at all temperatures as the numerical criterion necessary to comply with the narrative standard at § 465(4). CLF agrees that this criterion would comply with the existing narrative standard and would support existing and designated uses of Gulf Island Pond – and therefore is an appropriate standard to use in this TMDL.

DEP has recently proposed to change its numerical DO criterion so that it would only apply at 24° C. While we withhold judgment regarding whether a monthly average DO criterion at 24° C. is sufficient to meet the narrative standard and support existing and designated uses, we note that DEP and other agency biologists have concluded that anything less than 24° C. would be insufficient. See, e.g., Maine DEP Report to the 121st Legislature Joint Standing Committee on Natural Resources (January 5, 2004). Thus, applying the lower DO criterion – the 22° C. standard used in the TMDL – would most certainly not meet the narrative standard or support existing and designated uses. Modeling runs conducted by DEP prove that point: tests by Paul Mitnik found that easing of the monthly average DO criterion from 24° C. to 22° C. would result in a 30 percent change in waste load allocations assigned to the paper mills that are the largest contributors to water quality problems in Gulf Island Pond. Thus, the proposed BOD-5 limits are off by at least 30 percent, and must be revised.

*Response: This issue has been previously addresses in the responses to Maine Rivers comments.*

Phosphorous

CLF is also concerned that DEP's phosphorus modeling overestimates the volume of phosphorous that can be discharged by the upstream mills without causing algal blooms in Gulf Island Pond. DEP has apparently allowed for significant uptake of phosphorus in the river before mill discharges reach the pond. We disagree with this assumption. Phosphorus taken up by plants in the river above the pond will eventually move downstream as plants die off and will accumulate in Gulf Island Pond, where it will be available for algae blooms. Additionally, there is a significant problem of historic phosphorous loading, which reduces the likelihood that the upstream river can permanently remove this much phosphorous. This underscores the need for DEP to apply conservative margins of safety. Thus, we believe that significantly lower phosphorus limits are required.

*Response: This issue has previously been addressed in the responses to Maine Rivers comments. There is no evidence that bottom attached plants that die-off will eventually reach Gulf Island Pond and become phosphorus that is available for phytoplankton growth. They will most likely remain on the river bottom close to the area in which they originally propagated. The phosphorus readings within the Androscoggin River were consistent all summer which results in the conclusion that the phosphorus assimilated in the river is a long term phenomena. DEP explained previously in the responses to Trout Unlimited comments why historic phosphorus loading within the sediments of Gulf Island Pond should not be a significant issue.*

Total Suspended Solids

We disagree that the 2002 aquatic life non-attainment data in the Livermore Falls impoundment are an anomaly. DEP has only five summers worth of data: it may not simply dismiss the worst summer as an anomaly, particularly where the summer dismissed had the lowest flows recorded. Therefore, the TMDL must readjust its TSS figures.

*Response: This is addressed in the responses to NRCM comments. There are three other data sets that suggest that TSS loading could be higher than that experienced in 2002. The phased implementation will allow for additional sampling undertaken in the future at low flow conditions to confirm whether or not the 2002 data are an anomaly. This data has not been dismissed, and, in fact, has been used to list this river area as non-attainment. The exact TSS discharge levels are not currently known, and in the interim, the TMDL will be set as proposed.*

## Friends of Merrymeeting Bay

Letter of February 18, 2005
Ed Friedman, Chair

We appreciate the extensive modeling and field work the Department has undertaken to arrive at this proposed TMDL plan. However, we must bear in mind that this is years overdue and still not stringent enough for the general health of the river though in fact it may in the end meet minimal standards for particular elements of concern [DO, TSS, BOD, P & ortho-P].

The document does not appear to clearly specify what reductions the dischargers need take or come up with an allocation plan to institute. Continued negotiations with dischargers are likely to lead to more of the same, which is to say continued delay.

We don't believe an adequate case is made for the uptake of phosphorus [P] in the river section above Gulf Island Pond [GIP]. As plants in that section reach their maximum capacity for uptake excess P will make its way to GIP. Estimates made therefore of allowable discharge would appear not conservative enough to prevent loading of the Pond. The TMDL notes that collective dilution at 7Q10 flow is very low resulting in poor capacity provided by GIP for excessive nutrients.

We don't feel that there has been an adequate demonstration that proposed TSS discharges will prevent non-attainment and in fact they may likely impact aquatic life.

Looking at the big picture, we believe the Department must look to elimination of point source discharges plus necessary O2 supplementation as needed assuming dam removal does not occur. Millions of gallons a day discharge by the mills are responsible for the bulk of river degradation. While the TMDL focuses on a subset of elements, we can't forget that there are a host of unknown constituents that continue to be discharged and that all of the companies involved run cleaner low flow operations elsewhere.

We found possible evidence in the Kennebec below SAPPI in 2003 of endocrine disrupters and what we know now is likely just the tip of the iceberg.

*Response: The issues of specific allocations for each point source, phosphorus uptake in the Androscoggin River, and the TSS TMDL have previously been addressed in the responses to Maine Rivers and NRCM comments.*